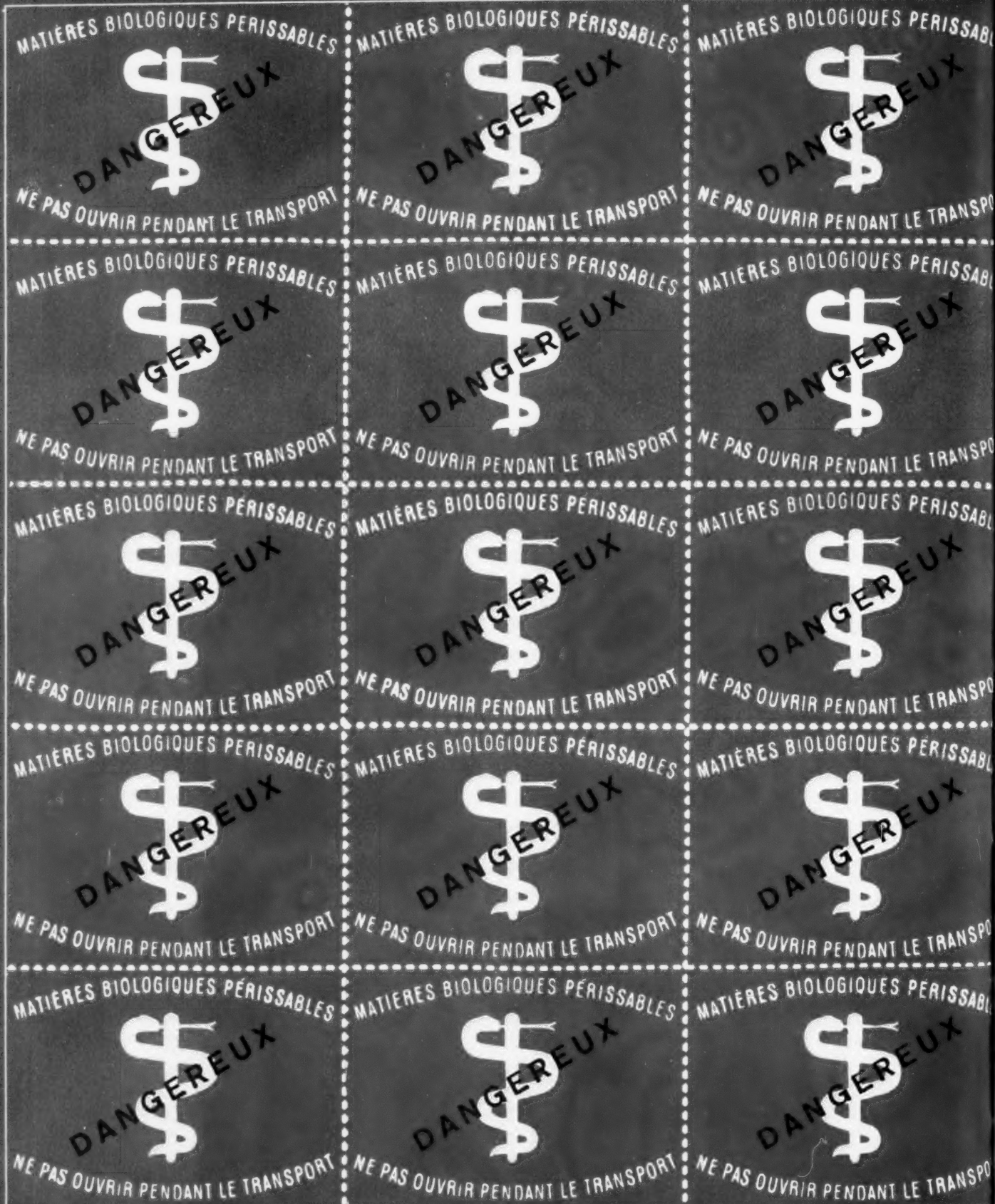


# PUBLIC HEALTH REPORTS

*In this issue*



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE  
Public Health Service



MAILING LABELS FOR INFECTIOUS SPECIMENS



# PUBLIC HEALTH REPORTS

Volume 75 Number 11

**NOVEMBER 1960**

*Published since 1878*

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### **frontispiece**

Violet mailing label adopted by the Convention of the Universal Postal Union for the international transport of infectious biological materials when shipped by mail. See article on the mailing of infectious specimens, pages 979-984.



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**SCIPLE, GEORGE W. (Public Health Service), HOSKING, WILLIAM O., and MONTGOMERY, C. HUNTER:** *A reappraisal of benzathine penicillin in gonorrhea control.* *Public Health Reports, Vol. 75, November 1960, pp. 1007-1010.*

Four different penicillin schedules were used in the therapy of acute gonorrhea in 3,622 men at the venereal disease clinic, Houston, Tex. The objective was to determine what effect benzathine penicillin might have on the gonorrhea control program in Houston.

Patients treated with a mixture of long- and short-acting penicillin showed lower retreatment rates during the first 4 weeks of followup than those receiving a single drug. This was presumably because of an antibiotic quarantine against reinfection, resulting from the prolonged action of the benzathine penicillin. In the next 12 weeks of followup, it was found that those patients treated with mixtures re-

turned with gonorrhea at a faster rate than did those treated originally with a single drug. After 16 weeks there was no appreciable difference in the cumulative retreatment rate for any of the schedules.

No correlation could be shown between the use of any schedule and changes in gonorrhea morbidity at the clinic. No long-term advantage to the control program could be demonstrated through benzathine penicillin therapy in acute gonorrhea in men.

Several disadvantages, both practical and theoretical, of long-acting penicillin in the therapy of acute gonorrhea in men are discussed.

**PACKER, HENRY, ACKERMAN, R.F., and HAWKES, JEAN M. (University of Tennessee College of Medicine):** *Screening for diabetes with the clinitron.* *Public Health Reports, Vol. 75, November 1960, pp. 1020-1024.*

Seven thousand two hundred and ninety-four persons applying for health cards were screened for diabetes, using testing levels of 130 mg., 160 mg., and 180 mg. with the clinitron, during consecutive periods of time. Retests with a modified glucose tolerance test were performed on all persons screening positive.

The percentage of persons tested who were found to have previously unrecognized diabetes ranged from 0.6 in the 30- to 39-year age group to 5.3 in the 60- to 69-year group. Age-adjusted rates based on the total number of known and new diabetics revealed higher rates in non-whites than in whites, with nonwhite

women showing the highest rate of any group (5.3 percent).

The highest yield of new diabetes cases (2.7 percent) was observed when testing was done between 1 and 2 hours after eating. Tests performed during this interval after eating also produced the lowest percentage of false positives in relation to total positive screening results.

The percentage of new cases found at the 130 mg. testing level (2.4 percent) was significantly higher than at higher screening levels. However, a significantly higher retest load was encountered at the 130 mg. level than at higher levels.

**MOLNER, JOSEPH G. (Detroit and Wayne County Departments of Health), and AGATE, GEORGE H.:** *Final report of poliomyelitis epidemic in Detroit and Wayne County, 1958.* *Public Health Reports, Vol. 75, November 1960, pp. 1031-1043.*

During 1958, Detroit and Wayne County, Mich., experienced a poliomyelitis epidemic which contrasted sharply with the racial and regional occurrence of this disease characteristic of outbreaks in the past.

The epidemic commenced late in July, reached a peak in September, and ended in November. The final count showed 412 paralytic cases and 25 fatalities. More than three-quarters of the paralytic cases were concentrated in the central area of the city and largely involved a Negro population of low economic status.

Sixty percent of the paralytic victims of the disease in Detroit had not reached their fifth birthday. Those in their second year of life were most susceptible.

The epidemic was due to type 1 and type 3 polioviruses, with type 1 predominating. Victims of paralytic disease had received little or no Salk vaccine.

A crash immunization program was inaugurated during the epidemic. Well-advertised poliomyelitis protection clinics were set up throughout the county but were especially concentrated in the epidemic areas.

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**KARPINOS, BERNARD D. (U.S. Department of the Army): *Racial differences in visual acuity. Public Health Reports, Vol. 75, November 1960, pp. 1045-1050.***

Better distant vision among Negro youths than among white (non-Negro) youths is indicated in a comparative study of visual acuity, using data from medical records of a 50 percent sample of Selective Service registrants examined for military service from January 1957 through September 1958. Of the Negro examinees, 82 percent showed 20/20 uncorrected bilateral vision as compared with 69 percent of the white examinees. The mean age of the white examinees was 21.8 years and that of the Negro examinees 21.6 years. About 72 percent of the Negro examinees and 71 percent of the white examinees were within the 21- to 22-year age group.

The probabilities of correctability of

defective vision among the Negroes are lower than among white youths. About 60 percent of the white youths with uncorrected distant vision of 20/100 could be expected to be corrected to as high as 20/20; the corresponding percentage for Negroes was 49. Comparable lower probabilities of correctability for Negroes are indicated for each visual reading of 20/40 and lower.

Included are the following basic tables, by race: cross distributions of the examinees by uncorrected distant vision in right and left eyes; distributions of examinees by uncorrected vision in both eyes and in at least one eye; and probabilities of correctability of uncorrected distant vision.

**BLOMQUIST, EDWARD T. (Public Health Service): *Chemotherapy, a public health measure against tuberculosis. Public Health Reports, Vol. 75, November 1960, pp. 1069-1076.***

To carry out the major recommendation of the Arden House Conference on Tuberculosis, "the widespread application of chemotherapy as a public health measure for the elimination of tuberculosis in the United States," three stages of control programs are suggested: in stage 1, when any significant proportion of persons known to have active disease are not being treated, most resources should be concentrated on treating active cases; in stage 2, the program can be expanded to include casefinding in high-incidence groups and treatment services to converters and some persons with inactive disease; in stage 3, efforts can be added to find and treat persons at high risk.

Many communities still at stage 1 need to increase their treatment resources. Services may be given by various agencies but should be coordinated by the health department. The scarcity of tuberculosis specialists calls for planning to use general practitioners or the medi-

cal staff of tuberculosis hospitals to provide continuing medical care to clinic patients. Laboratory and X-ray services, drugs, and public health nursing services are also essential. Special effort is required to help make it possible for patients to stay on treatment as long as they need it.

An orderly plan for chemotherapy as a public health measure includes hospitalization for patients who need it, participation by hospitals in clinic services, and recognition that the best use of a shortened hospital stay may solve some of the problems of patients who leave against advice.

While efficient and effective treatment services are possible under many different organizational plans, the present situation in tuberculosis calls for coordination at the State level, in order to make sure that patients are treated no matter whether they live in low or high incidence areas, and also for the sake of economical operation.

**HARMSTON, F. C., and WRIGHT, C. T. (Public Health Service): *Distribution and control of rats in five Rocky Mountain States. Public Health Reports, Vol. 75, November 1960, pp. 1077-1084.***

Investigations on the distribution and control of domestic rats were conducted in Colorado, Idaho, Montana, Utah, and Wyoming, from 1947 until 1955, by representatives of the Public Health Service in cooperation with personnel from the State and local departments of health.

The studies showed domestic rats to be present in each of these States, and in the majority of cases, the areas of infestation are rapidly expanding despite periodic poisoning campaigns which have been used as the principal method of control during the past 30 to 40 years.

## New Members of the PHR Board of Editors



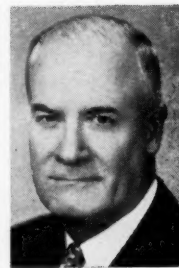
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The Board of Editors of *Public Health Reports* has gained four new members, who will serve for 3 years. Retiring from the board are Dr. Harold D. Chope, J. Stewart Hunter, Dr. Alexander Langmuir, and Dr. Wilson T. Sowder.

**Herbert R. Domke, M.D., Dr.P.H.**, has been director of the Allegheny County Health Department and adjunct associate professor in the Graduate School of Public Health, University of Pittsburgh, since January 1959. He was health commissioner of the St. Louis County Health Department for the previous decade, during which he also served as assistant professor of preventive medicine and public health at Washington University. In the period 1944-47, he was chief medical officer of the Chicago Health Department.

Dr. Domke obtained a doctorate in public health in 1959 from the Harvard School of Public Health, writing his thesis on "Social Class and the Childhood Diseases."

His published papers have been in the areas of public health administration in metropolitan areas, nursing home management, and in community mental health research and program development. He is a reserve officer and consultant in the Public Health Service.

**Robert Dyar, M.D., Dr.P.H.**, is chief of the division of research in the California State Department of Public Health. Prior to his appointment to the post in 1959, he had served as chief of the division of preventive medicine since 1945.

A graduate of the University of Minnesota Medical School, Dr. Dyar received his doctorate in public health from the Johns Hopkins University School of Hygiene and Public Health, where he taught in the department of epidemiology for 2 years before joining the staff of the San Joaquin Local Health District in Stockton, Calif., in 1940.

Dr. Dyar is a faculty member of the University of California School of Public Health. He is a diplomate of the American Board of Preventive Medicine and a member of numerous professional organizations including the American Epidemiology Society and the American Public Health Association, in which he is a member of the governing council and chairman of its research policy committee. He is also a member of the Advisory Committee on Epidemiology and Biometry Training of the National Institutes of Health, Public Health Service.

**Wesley E. Gilbertson, B.S.E.E., M.S.P.H.**, is chief of the Division of Engineering Services, Public Health Service, a post he has held since 1959. For the previous 5 years, he was deputy chief of the Division of Sanitary Engineering Services.

Mr. Gilbertson started a career of 25 years in public health and sanitary engineering as a district sanitation supervisor in North Dakota. He also served as State milk control officer. As a commissioned officer in the Public Health Service, during 1942, he helped set up in Atlanta, Ga., the Office of Malaria Control in War Areas, forerunner of the Communicable Disease Center. During World War II, Mr. Gilbertson organized a dengue mosquito control program in Honolulu in the face of an epidemic hazardous to the war effort. After serving as executive officer of the Communicable Disease Center until 1951, he headed the Division of Civilian Health Requirements in the Office of the Surgeon General.

In 1951, Mr. Gilbertson was a delegate to the World Health Assembly and represented the United States at the Congress of Local Authorities in England. For the past 3 years, he has been on the Sanitary Engineering Advisory Panel of the International Cooperation Administration.

A fellow of the American Public Health Association and member of the section council of the engineering and sanitation section of that organization, he has served, since 1959, as chairman of the engineers in government practice section of the National Society of Professional Engineers.

**James R. Shaw, M.D.**, has been chief of the Division of Indian Health, Public Health Service, since 1955. Detailed by the Service in 1953 to the Department of the Interior, he served 2 years as chief of the Branch of Health in the Bureau of Indian Affairs. During the previous year, he was chief of the Service's Division of Hospitals.

A member of the Public Health Service commissioned corps since 1938, Dr. Shaw served in hospitals of the Service and in the U.S. Coast Guard. He became officer-in-charge of the Detroit hospital in 1949.

After receiving his medical degree from the University of Michigan Medical School in 1936, Dr. Shaw followed postgraduate work at the Mayo Clinic. He is a fellow of the American College of Physicians and member of Alpha Omega Alpha, the American Medical Association, the American Public Health Association, and the Association of Military Surgeons.



## Mailing of Infectious Specimens for Diagnostic Purposes

U. PENTTI KOKKO, M.D., Dr.P.H., JOHANNES STUART, Ph.D., and GERALD TAYLOR, Ph.D.

FOR the past several years the U.S. Post Office Department, the Universal Postal Union, and the World Health Organization, as well as the Public Health Service, State health department laboratories, and other domestic health agencies, have been concerned with improving the procedures for rapid and safe transmission to diagnostic and research laboratories of material containing or suspected of containing pathogenic organisms.

Such organisms form only a small part of the diagnostic shipments. Most of the material received by laboratories is not even suspected of containing infectious agents. For example, in 1958 only 4 to 9 percent of the total specimens received by six State laboratories, for which information was at hand, were sent to be tested for the presence of a live infectious agent.

The Communicable Disease Center of the Public Health Service, the major Federal recipient and transmitter of infectious diagnostic specimens, has defined such specimens as follows:

1. All specimens of human or animal excreta, secreta, tissue or tissue fluids, or hair, which contain or are suspected of containing a live causative agent of a human disease or an animal disease transmissible to man, and which are shipped or mailed to a

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*Two of the authors are with the Communicable Disease Center, Public Health Service, Atlanta, Ga. Dr. Kokko is deputy chief, Laboratory Branch, and Dr. Taylor is chief, Service Unit, Diagnostic Reagents Section. Dr. Stuart is public health adviser, Office of the Surgeon General, Public Health Service, Washington, D.C.*

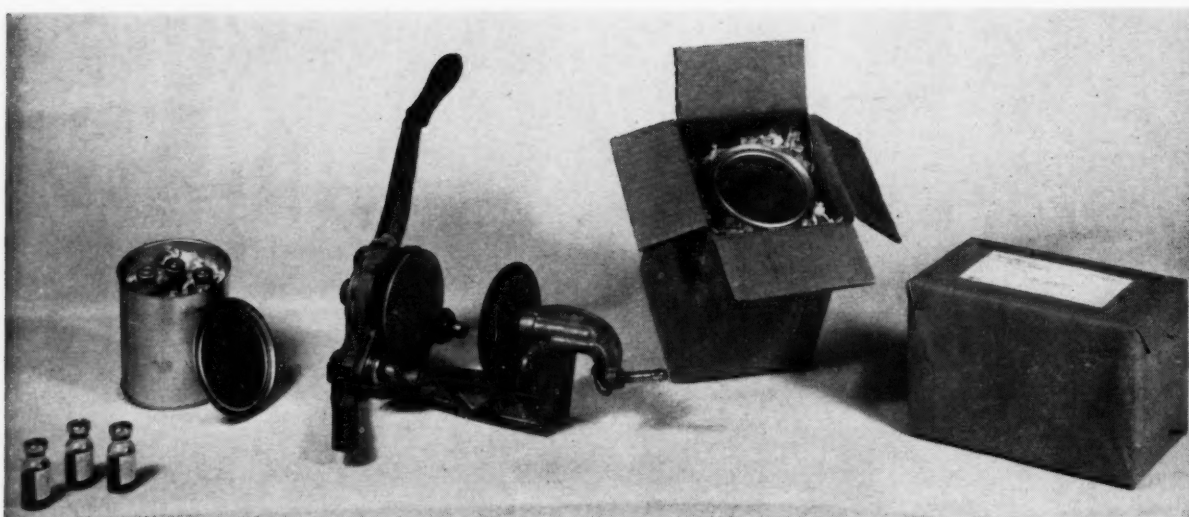
diagnostic or research laboratory for isolation and identification of the etiological agent.

2. Pure cultures or concentrated isolates or vectors of etiological agents shipped from the isolating or collecting laboratory to a specialty laboratory for identification and typing, or further research, or both.

3. Pure cultures of known etiological agents which are used as reference cultures or as antigens in diagnostic laboratory procedures.

We have been unable to learn of any instance in which a person employed in transportation was infected with disease through handling of diagnostic specimens or other mail with which the specimens might have come in contact. It has been recognized that the hazards of shipping these specimens are relatively low and that their rapid and unobstructed movement is of vital importance in communicable disease control. There are no regulations in effect or contemplated which would hamper the free movement of this material. Yet this comparative freedom from regulation should not serve to encourage the neglect of adequate precaution in the shipment of diagnostic specimens.

Because the Laboratory Branch, Communicable Disease Center, annually processes and mails out large numbers of infectious specimens, a series of experiments were conducted to develop a shipping procedure which would be safe, simple, and inexpensive and which would comply with the principles of the Public Health Service regulations governing the shipment of etiological agents (1) and also with the conditions set by the Convention of the Universal Postal Union (see excerpt p. 983). As a result of these experiments, a safe and practical packaging procedure has been adopted



**Figure 1. Steps in assembling package**

for all shipments of infectious diagnostic material from the Laboratory Branch. This procedure has been tested by actual use for more than a year and has already been introduced to State laboratory directors.

In brief, the packaging procedure is as follows. The specimen is enclosed in a bottle or tube of thick glass which is sealed with a rubber or paraffin-treated cork. Enclosure by fusion, of course, is also acceptable. Screwcaps are not recommended because leakage frequently occurs, particularly when outside pressure decreases during air transportation. The cork is secured with a metal collar or with a good grade of adhesive tape. The glass container is then placed in an airtight and watertight tin can with vermiculite, sawdust, or other suitable material for insulation. The can is packed in a cardboard container with shock-resisting insulating material and wrapped for shipping (fig. 1).

Glass bottles are preferred to test tubes because of their greater shock resistance and are used by the Laboratory Branch whenever practical. However, heavy-walled test tubes are entirely acceptable provided there is sufficient space in the can for shock-absorbing material to be packed all around the tube. If several tubes are packed in the same can, it is important that they be wrapped individually in soft paper or cloth to provide adequate insulation between the tubes.

The bottles presently being used at the Labo-

ratory Branch are regular hard glass serum bottles in sizes from 2 ml. up. The bottles are sealed with a rubber stopper secured in place with an aluminum collar. Prices of the bottles, depending on size, quantity, and type of stopper, begin at 2 cents per setup.

The tin cans in use are regular No. 3 household cans sealed by roll crimping the lid with a home canning device. The cans are priced at approximately 12 cents each when purchased in quantities of 100. The price of a satisfactory canning device is less than \$15. Pressure-sealed paint cans in quantities of 100 are priced approximately as follows: pint, 11 cents each; quart, 13 cents; half gallon, 23 cents; gallon, 29 cents. For an occasional shipper, such as a research institute or hospital, they offer the advantage of not requiring a crimping device. The larger sizes are practical for occasional large-quantity shipments and may be used as the outer containers required by the international postal regulations.

In our experiments, the No. 3 crimped-sealed cans proved to be remarkably resistant to various outside forces. They withstood slow vertical pressure of 3,000 pounds per can very well. "Rapid" pressure of 3,000 pounds slightly indented the cans but did not break the bottles inside. They resisted horizontal pressures up to 800 pounds per can without losing their shape. When the pressure was increased to 1,200 pounds, the cans were compressed to a boxlike shape, still without break-

ing the bottles inside (fig. 2). Sharp shocks produced by dropping unwrapped cans onto concrete several times from a height of 20 feet caused only slight denting of edges (fig. 3).

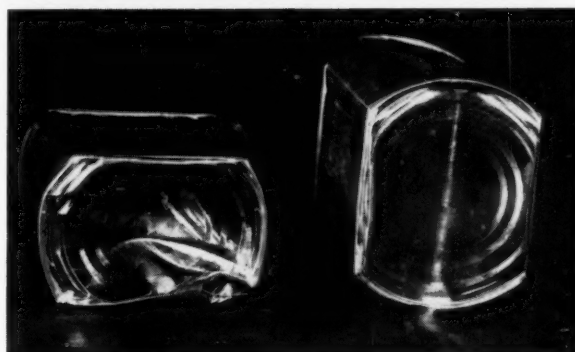
Since a considerable percentage of diagnostic specimens are sent by airmail, a number of airdrops were also performed. This was made possible through the assistance of the Naval Air Station, Marietta, Ga. (then of Chamblee, Ga.). Surprisingly little damage was caused by dropping packages and unwrapped cans from an airplane flying at an altitude of 1,000 to 1,500 feet (fig. 4).

The only breakage of the contents of the cans in the airdrops occurred in a can which contained 16 regular 15- by 150-mm. test tubes, the only insulating material being a thin layer of paper between the tubes. In this can, 1 tube of the 16 broke; the others remained intact. All other glass containers, including several milk-dilution bottles which were packaged with a sufficient amount of shock absorber, were unbroken and unopened. Seventeen packages were dropped in this experiment.

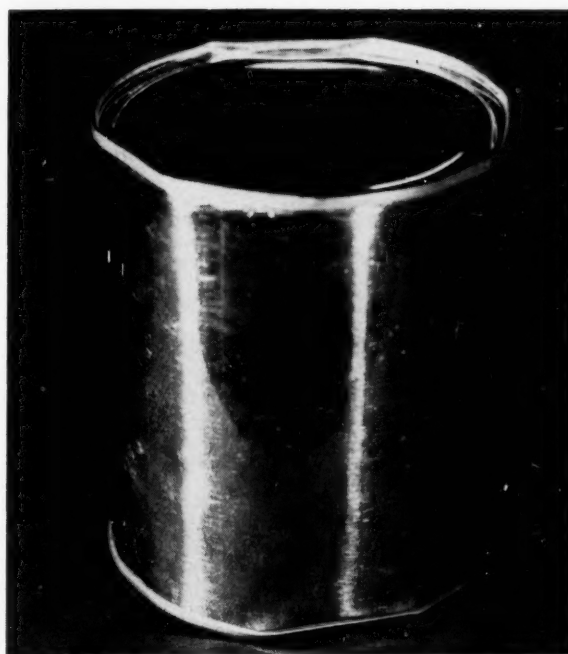
Rapid decompression experiments were conducted through the cooperation of the U.S. Naval School of Aviation Medicine, Pensacola, Fla. In these tests, explosive decompression to 1.69 pounds per square inch in 0.1 second, corresponding to the maximum stress likely to be encountered if the cabin of an airplane should suddenly decompress at an altitude of 50,000 feet, caused only slight bulging on the ends of the cans. The leakage from the bottles in the cans was checked by using varying amounts of colored alcohol in the bottles and white absorbent cotton around the neck of the bottles (fig. 5). No leakage occurred.

Actively metabolizing *saccharomyces* cultures did not cause any observable bulging of the sealed cans during a sustained incubation period at 37° C.

Our experience with the paint cans has been essentially the same as with No. 3 household cans. None of the paint cans came open despite rough handling (fig. 4). However, our experiments with paint cans have been limited to products of one manufacturer. Therefore, we are recommending that until additional experience is gained, the lid of larger size paint cans be spot soldered before wrapping. It can be



**Figure 2.** Above, cans subjected to 3,000 pounds vertical pressure; below, cans subjected to 1,200 pounds horizontal pressure



**Figure 3.** Unwrapped can dropped 10 times onto concrete from height of 20 feet



done easily by using low-melting wire solder. Three or four spots are believed to be sufficient.

The staff of the Communicable Disease Center, on the basis of the tests cited, is convinced of the safety in shipment of infectious or potentially infectious diagnostic specimens packaged in the manner described and commends these procedures to laboratories and others concerned.

The Laboratory Branch was informed recently that the Post Office Department, with more than 36,000 post offices, cannot possibly insure that packaging requirements will be complied with. Therefore, the Department does not rely on regulations and their enforcement for compliance but on a criminal statute which places the liability on shippers for proper packaging.

The criminal statute concerned (18 U.S.C. 1716) is of material interest to all shippers of diagnostic specimens whether potentially pathogenic or not. In fact, most intransit damage to laboratory specimens involves blood specimens for serology and urine specimens for chemical testing rather than testing for pathogenic organisms. If spillage occurs so as to injure or damage mail, equipment, or personnel, the shipper may face prosecution even though there is no question of hazard from an infectious agent. The value of careful packaging with a sufficient amount of absorbing material around the glass to soak up any leaking fluid, therefore, extends well beyond the major concern of this report, the prevention of infection.

Regarding the international transport by mail of perishable biological material which may contain living pathogenic micro-organisms and viruses, the most recent Convention of the Universal Postal Union contains two main points:

- Letter mail containing perishable biological materials shall be packed according to the precise description given and identified by a label adopted for the purpose. (The label is illustrated on the frontispiece.)
- Such letters shall be exchanged only between "officially recognized laboratories."

More complete information on the provisions of this convention and packaging requirements

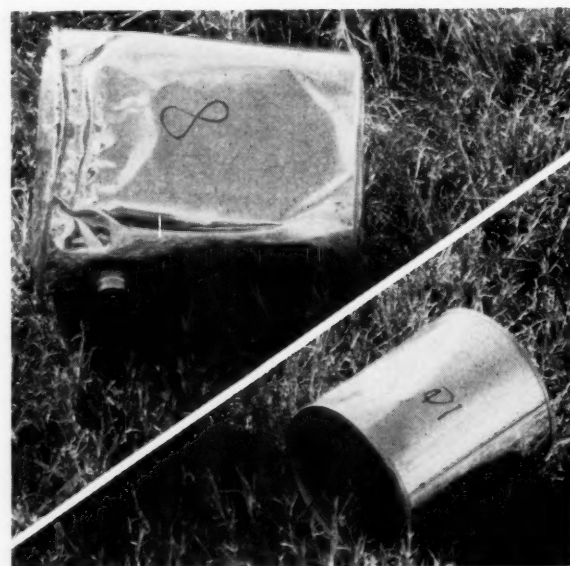
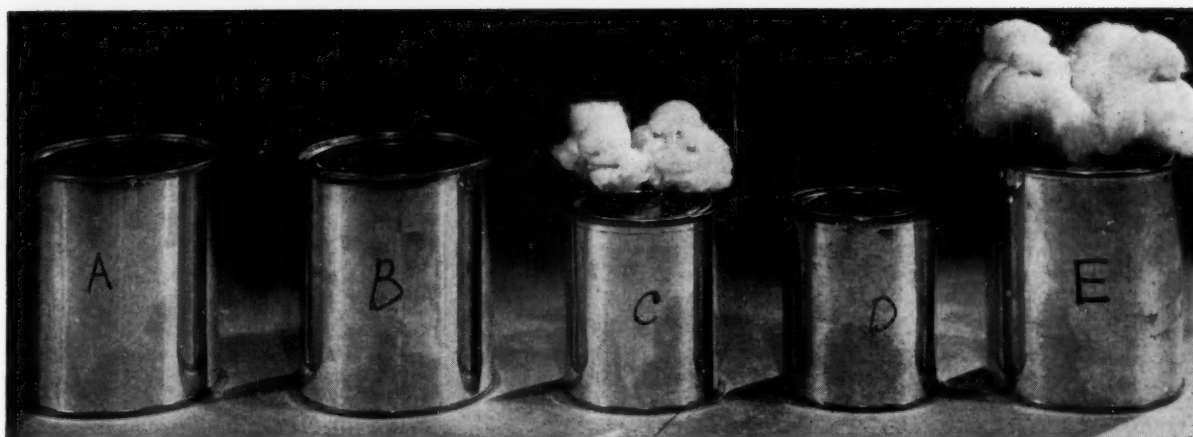


Figure 4. Packages and cans dropped on hard sun-baked ground from a plane at 1,000 to 1,500 feet altitude. Above, package with least damage; center, package with most damage; below, unwrapped cans



**Figure 5.** Cans subjected to explosive decompression to 1.69 pounds per square inch in 0.1 second. A and B are household cans, C, D, and E, paint cans. Bottles on top of C and E were removed from cans after the experiments. Colored alcohol was put inside the bottles and cotton around the necks to check for leakage

for international mailing are given in the excerpt from the Postal Manual below.

In order to avoid misunderstanding, it should be pointed out that the requirement of the Convention of the Universal Postal Union to use violet-colored labels on packages carried in international letter mail is in addition to and not in lieu of any Federal quarantine regulations (2,3) which require an import permit for etiological agents and vectors. For human pathogens, request for an import permit should be made in advance to the Surgeon General, Public Health Service, Attention, Division of Foreign Quarantine, Washington 25, D.C., and for animal pathogens, to the Inspection and Quarantine Division, Agricultural Research Service, Department of Agriculture, Washington 25, D.C. Shipments arriving without permits are subject to delay which may destroy the viability of the specimens. An advance permit from the Department of Agriculture is also required when shipping imported animal pathogens and vectors between laboratories in the United States.

#### EXCERPT FROM POSTAL MANUAL

##### 221.325 *Perishable Biological Materials*

###### a. Mailing Restriction

Perishable biological materials, including those of pathogenic nature, when sent in the postal union mail may be sent only as letter packages packed as prescribed in 221.325c, and may be sent only to the countries that have agreed to accept them. The packages must bear distinctive violet labels by which they can

readily be recognized and receive careful handling and prompt delivery. The countries that have agreed to accept letter packages containing perishable biological materials are:

Aden	Malta
Argentina	Mauritius
Australia	Netherlands Antilles
Austria	New Zealand
Barbados	Nigeria
Belgian Congo	North Borneo
Belgium	Norway
Bermuda	Persian Gulf ports
Cayman Islands	Philippines
Cyprus	Poland
Czechoslovakia	Portugal
Denmark	Rhodesia and Nyasaland
Falkland Islands	Saint Helena
Fiji Islands	Salvador (El)
Germany (Eastern)	Sarawak
Ghana	Sierra Leone
Gibraltar	Somaliland Protectorate
Gilbert and Ellice Islands	Spain
Great Britain and Northern Ireland	Sudan
Hong Kong	Sweden
Hungary	Switzerland
Iceland	Tanganyika
India	Trinidad
Israel (infectious substances not permitted)	Turkey
Jamaica	Turks Islands
Japan	Union of South Africa, except Basutoland and Swaziland (added February 25, 1960)
Kenya and Uganda	Uruguay
Lebanon	Zanzibar
Malaya	

###### b. Qualification of Mailers

(1) Only officially recognized laboratories may send or receive letter packages containing perishable

biological materials. Laboratories of the following categories are so designated:

Laboratories of local, State, and Federal Government agencies.

Laboratories of federally licensed manufacturers of biological substances derived from bacteria and viruses.

Laboratories affiliated with or operated by hospitals, universities, research facilities, and other teaching institutions.

Private laboratories licensed, certified, recognized, or approved by a public authority.

(2) A laboratory desiring to mail letter packages containing materials of this kind shall make written application on its letterhead stationery to the International Service Division, Bureau of Transportation, Post Office Department, Washington 25, D.C., explaining its qualifications and those of the prospective addressee to send and receive such materials, and stating how many packages are to be mailed. On approval, the mailer will receive a sufficient number of the violet labels for the contemplated shipments.

#### c. Packaging

(1) Perishable biological material not of a pathogenic nature must be packed in a nonporous container surrounded by sufficient absorbent material to take up all the liquid and must be placed in an outer protective container where it should fit tightly to avoid any shifting.

(2) Perishable biological material of a pathogenic nature must be packed in a tightly closed bottle or tube of heavy glass wrapped in thick, absorbent material rolled several times around the bottle or tube and tied at the ends, sufficient in quantity to absorb all the liquid; the wrapped container must be placed in a strong, well-closed metal box so constructed as to prevent any contamination outside of it. This metal box must be wrapped in cushioning material and placed in an outer protective box where it should fit tightly so as to avoid shifting. The outer container must consist of a hollow block of strong wood, metal, or other equally strong material with a tight lid so fitted that it cannot open during transportation.

(3) In addition to the requirements in (1) and (2), packages must comply with the regulations governing the transmission of such materials in the domestic mail.

(4) The mailer must place on each package one of the violet labels mentioned in a and b(2).

#### REFERENCES

- (1) U.S. Public Health Service: Regulations. Shipment of certain things. 42 CFR 72.25 (1960).
- (2) U.S. Public Health Service: Regulations. Importation of certain things. 42 CFR 71.156 (1960).
- (3) U.S. Department of Agriculture, Bureau of Animal Industry: Regulations. Organisms and vectors. 9 CFR 122.1 (1959).

## Anti-Pollution Study in Great Lakes Basin Waterway

A 6-year anti-pollution study of the U.S. portion of the Great Lakes Basin-Illinois Waterway was launched by the Public Health Service in September 1960.

The study, which was authorized by the 86th Congress with \$500,000 for the first year, is designed to aid the development of a comprehensive plan to control and prevent pollution in the area.

Under the jurisdiction of the Service's Division of Water Supply and Pollution Control, immediate efforts are directed to:

- An inventory of all points of inflow into the Chicago River, Sanitary and Ship Canal, the Calumet-Sag Canal, and their tributaries.

- Measurement and analysis of municipal and industrial wastes being discharged at such points of inflow.

- Effect of such discharges on water quality of the Illinois Waterway under present rate of flow.

- Methods of improving the water quality of the Illinois Waterway.

- Determination of the water quality of the Illinois Waterway under present and various decreased rates of flow.

Project headquarters are in Chicago, under the direction of William Q. Kehr, Public Health Service engineer. The overall project, with a staff of 40 scientists and technicians, is coordinated by H. W. Poston, water program director of the Service's regional office in Chicago.

A special master of the Supreme Court has been conducting hearings in cases which concern the use of Lake Michigan water and to which the States of Wisconsin, Michigan, Illinois, Minnesota, New York, Pennsylvania, and Ohio and the United States are parties. The study has been planned so that data gathered in the first phases will assist the Court in making its decisions.



# New and Improved Antigen Suspension for Rapid Reagin Tests for Syphilis

JOSEPH PORTNOY, Ph.D., and WARFIELD GARSON, M.D., M.P.H.

THE RAPID REAGIN tests for syphilis using unheated plasma or serum (1-3) make use of an antigen suspension prepared by resuspending centrifuged VDRL slide antigen suspension in choline chloride. In an early publication (1) it was noted that the antigen suspension was stable for a period of at least 1 week. Subsequent observations indicated that some antigen suspensions retained their reactivity for as long as 18 months. However, it was evident that there was no uniformity to this stability; and, indeed, it was found that the antigen suspension might become subreactive even after 1 day of storage. This erratic behavior, although not vitiating the usefulness of the rapid reagin tests, constituted a disadvantage.

It was soon realized that the ultimate solution to the development of a more uniformly stable antigen suspension would depend upon the elucidation of the mechanism by which suspensions of antigen underwent altered reactivity. The investigations to be reported indicated that loss in antigen reactivity was mediated by an oxidative process which is catalyzed by cations. By use of a chelating agent to bind these cations a uniformly stable antigen suspension was obtained.

## Materials and Methods

The RPR test was conducted according to the Manual of Serologic Tests for Syphilis (4).

Variations from standard procedures for preparing antigen suspension will be noted under particular experiments.

Stock solutions of cations were prepared

from reagent grade chemical dissolved in distilled water to a concentration of  $10^{-2}$  M. These were further subdiluted in water as indicated.

Antigen suspensions were stored in screw-capped test tubes at indicated temperatures and were brought to room temperature before testing. The stability of antigen suspensions was determined by use of serial twofold dilutions of pooled reactive human serum in saline.

## Effect of Cations and Peroxide

RPR antigen suspensions were prepared to contain  $10^{-5}$  M concentrations of the cations indicated and 0.5 percent hydrogen peroxide. This was accomplished by preparing a concentrated RPR suspension which was then dispensed in suitable aliquots and adding the required cations and peroxide. Following the addition of these reagents the antigen suspensions contained the usual concentrations of choline chloride (10 percent), sodium chloride (0.85 percent), and merthiolate (0.01 percent).

The capacity of the various cations to flocculate antigen suspension, independent of reagin, was determined on the day the antigens were originally prepared, by testing the indicated solutions against regular RPR antigen. Table 1

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*The authors are with the Communicable Disease Center, Public Health Service. Dr. Portnoy is assistant director, Venereal Disease Research Laboratory, Chamblee, Ga., and Dr. Garson is director, Venereal Disease Experimental Laboratory, University of North Carolina School of Public Health, Chapel Hill. Technical assistance in the preparation of the paper was provided by Carl S. Adams.*

shows that  $\text{Cu}^{++}$ ,  $\text{Fe}^{++}$ ,  $\text{Fe}^{+++}$ , and  $\text{Zn}^{++}$  produced clumping at a dilution of  $10^{-3}$  M, whereas  $\text{Ag}^{+}$  caused clumping at a concentration of  $10^{-4}$  M. The other cations did not flocculate the antigen at  $10^{-3}$  M or lower concentrations. It was further determined that on the day they were prepared the antigens incorporating cations alone or in combination with peroxide gave results with test serums equal to that of a control antigen.

On storage at room temperature,  $\text{Cu}^{++}$  produced a loss in reactivity in 1 week;  $\text{Fe}^{+++}$ ,  $\text{Ca}^{++}$ , and  $\text{Zn}^{++}$  caused a loss in reactivity in 2 weeks; the other cations showed no effect greater than the control antigen (table 1). In the presence of peroxide a shortening of the reactivity loss period was noted with  $\text{Mg}^{++}$  and  $\text{Co}^{++}$ .

#### Effect of EDTA on RPR Antigen Suspensions

Because of the pronounced activity of  $\text{Cu}^{++}$ , experiments were designed to determine the effect of varying concentrations of this cation alone or in combination with peroxide. The ability of ethylene dinitrilo tetra-acetic acid, disodium salt (EDTA) to overcome the deteriorative effects of copper and peroxide was determined. The experimental design was similar to that reported above for study of the different cations. EDTA was prepared as a

**Table 1. Effect of various cations and peroxide on the stability of RPR antigen**

Salt used	Cation valence	Stability in presence of—		Flocculating action
		Cation alone <sup>1</sup>	Cation and peroxide <sup>1</sup>	
Cupric sulfate-----	2	1	1	$10^{-3}$ M.
Ferrous chloride----	2	3	2	$10^{-3}$ M.
Ferric chloride-----	3	2	2	$10^{-3}$ M.
Magnesium sulfate----	2	3	1	Negative.
Manganese chloride----	2	3	2	Do.
Nickel chloride-----	2	3	2	Do.
Cadmium chloride-----	2	2	2	Do.
Cobalt chloride-----	2	3	1	Do.
Zinc acetate-----	2	2	2	$10^{-3}$ M.
Mercuric chloride----	2	3	2	Negative.
Silver nitrate-----	1	3	2	$10^{-4}$ M.
Controls:				
No cation, no peroxide-----		3		
Peroxide alone-----		2		

<sup>1</sup> Number of weeks at which time reactivity less than standard was observed.

stock 0.2 M solution in water, adjusted to pH 7.0 (potentiometric) with NaOH and incorporated into the antigen suspensions. Storage was at room temperature.

The deteriorative influence of  $\text{Cu}^{++}$  alone and the accelerated change produced by both the cation and peroxide can be observed in table 2.

**Table 2. Effect of peroxide, copper ions, and EDTA on the stability of RPR antigen**

Antigen	Peroxide	Concentration copper (molar)	Concentration EDTA (molar)	Days storage at room temperature				
				1	7	14	22	31
1-----	(+)	$10^{-4}$	0	L	L	M	M	M
2-----	(+)	$10^{-5}$	0	S	L	L	M	M
3-----	(+)	$10^{-6}$	0	S	L	L	L	L
4-----	(+)	0	0	S	S	L	L	L
5-----	0	$10^{-4}$	0	S	S	S	L	L
6-----	0	$10^{-5}$	0	S	L	L	L	L
7-----	0	$10^{-6}$	0	S	S	L	L	L
8-----	0	0	0	S	S	S	L	L
9-----	(+)	$10^{-4}$	$1.25 \times 10^{-2}$	S	S	S	S	L
10-----	(+)	$10^{-4}$	$1.25 \times 10^{-4}$	S	S	S	S	L
11-----	(+)	$10^{-4}$	$1.25 \times 10^{-6}$	S	L	M	M	M
12-----	(+)	$10^{-5}$	$1.25 \times 10^{-2}$	S	S	S	S	L
13-----	(+)	$10^{-5}$	$1.25 \times 10^{-4}$	S	S	S	S	L
14-----	(+)	$10^{-5}$	$1.25 \times 10^{-6}$	S	L	L	L	L

S—Reactivity equal to standard.

M—Reactivity greater than standard.

L—Reactivity less than standard.

+—Present in concentration of 0.5 percent.

0—Absent.

EDTA in a concentration as low as  $1.25 \times 10^{-4}$  M inhibited these deteriorative changes for 3 weeks.

### Old and Improved RPR Suspensions

The sediments from a common pool of VDRL slide antigen emulsion were resuspended in the usual way to yield the "old" or regular RPR suspension and in the following solution to produce the "improved" RPR suspension:

	Milliliters
0.1 M EDTA in distilled water.....	2.5
40 percent choline chloride in distilled water....	5.0
0.02 M phosphate buffer, 0.2 percent merthio- late <sup>1</sup> .....	10.0
Distilled water.....	2.5

<sup>1</sup> Na<sub>2</sub>HPO<sub>4</sub> 1.42 gm., KH<sub>2</sub>PO<sub>4</sub> 1.36 gm., merthiolate 1.00 gm., distilled water to 500 ml., pH of solution 6.9.

The volume of the resuspending solution was in each instance equal to the volume of the antigen emulsion centrifuged.

Duplicate preparations of antigen suspensions were stored at refrigerator, room, and incubator (35° C.) temperatures. Table 3 indicates the superiority of the improved suspension. Whereas the old type varied in stability from 1 to 17 weeks, the improved suspension, particularly when stored in the refrigerator, was good for at least 8 months. Lesser stability was observed at room and incubator storage conditions.

Table 4 presents the results of comparative tests with unheated plasma and unheated serum samples. The improved suspension was only slightly less reactive than the old type.

### Discussion

The possible role of cations in producing unstable characteristics in lipid antigens was suggested by the work of Ray, Davisson, and Crespi (5) who studied the degradative changes of the lipoproteins of rabbit and human serums undergoing dialysis. When all traces of cupric ions were removed the lipoprotein was stable on dialysis. Numerous other metal ions were without effect. Changes similar to those occurring during dialysis could be experimentally produced by the addition of hydrogen peroxide

and a trace of Cu<sup>++</sup>. The presence of a chelating agent inhibited the reaction. Ray and co-workers suggested that the degradation was oxidative in nature and catalyzed by copper.

The observations made in the present study suggest that a similar mechanism underlies the loss in reactivity of lipid antigen suspensions. Of the cations studied, copper was most active in producing degradation even in the absence of added peroxide. Magnesium and cobalt were quite active in the presence of added peroxide. EDTA reversed the deteriorative changes produced by copper and peroxide. The subsequent incorporation of EDTA into RPR suspension produced uniform stability particularly when suspensions were stored in the refrigerator. The omission of sodium chloride from the improved suspension was prompted by the observation that a finer dispersion of particles was obtained with nonreactive specimens. The reactivity of the improved sus-

**Table 3. Comparison of stability of old and new types of RPR antigen**

Type of antigen	Number of lots	Expiration period (weeks) when stored in—		
		Refrigerator	Room	Incubator
Old.....	16	1-17.....	1-11	2-10.
New.....	16	Indefinitely	8-25	22 or more.

**Table 4. Comparison of reactivity of regular and improved RPR antigen suspension**

Type of sample	Results with regular antigen	Number	Results with improved antigen		
			Reactive	Weakly reactive	Nonreactive
Plasma..	Reactive.....	35	35	-----	-----
	Weakly re- active.....	2	1	1	-----
	Nonreactive....	43	-----	-----	43
Serum....	Reactive.....	50	47	3	-----
	Weakly re- active.....	6	-----	3	3
	Nonreactive....	81	-----	-----	81



pension was found to be essentially similar to regular RPR suspension.

Samples of the improved suspension exposed to a wide variation of temperature over a 10-day period have maintained a uniform stability. These samples varied in age from 1 to 7 months at the time they were exposed. Preliminary studies have likewise suggested that the principle of preservation by the addition of EDTA may be of value for other lipid antigen emulsions used in the serology of syphilis, but further experience is needed before a specific recommendation can be made for its broader use.

### Summary and Conclusions

The loss of reactivity of stored antigen suspensions used in reagin tests for syphilis is mediated in part by an oxidative process and catalyzed by cations.

More uniformly stable antigen suspensions were obtained by the incorporation of a chelat-

ing agent ethylene dinitrilo tetra-acetic acid, disodium salt (EDTA) in antigen suspension used in the rapid reagin tests.

The use of this agent in the suspensions used for the rapid reagin tests is recommended.

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- (2) U.S. Public Health Service: Serology evaluation and research assembly (SERA), 1956-1957. PHS Pub. No. 650. Washington, D.C., U.S. Government Printing Office, 1959.
- (3) Portnoy, J., and Garson, W.: A preliminary report on RPR test for syphilis using unheated serum. Pub. Health Rep. 74: 965-968, November 1959.
- (4) U.S. Public Health Service: Manual of serologic tests for syphilis. PHS Pub. No. 411 (1959). Washington, D.C., U.S. Government Printing Office, 1959.
- (5) Ray, B. R., Davisson, E. O., and Crespi, H. L.: Experiments on the degradation of lipoproteins from serum. J. Phys. Chem. 58: 841-846 (1954).

## Unexploited Breakthroughs in Cancer Research

Although the ultimate research goals in cancer are still in the future, Dr. Michael B. Shimkin of the National Cancer Institute, Public Health Service, directs attention to the following discoveries that, if fully applied, would have a major impact upon the occurrence, mortality, and tragedy of cancer.

*In the prevention of cancer*, the elimination of the cigarette habit would reduce the incidence of lung cancer by 60 percent, a saving of some 20,000 deaths from lung cancer per year. Additional reduction in the lung cancer incidence could be achieved by controlling major sources of air pollution, such as fumes from automobile exhausts. (Burney, L. E.: J.A.M.A. 171: 1829-1837, Nov. 28, 1959. Shimkin, M. B.: *In Tumors of the Chest*, edited by D. Spain, New York, Grune and Stratton, 1960, pp. 1-16.)

*In the diagnosis of cancer*, the application of cervical cytology to the total female population remains unrealized. Self-obtained smears, central laboratories to which smears could be mailed, and intensi-

fied research in methods of cytoanalysis need to be applied to solve the logistics of this problem. The full use of this discovery should reveal 10,000 cases of cervical cancer and precancer per year, at a stage when the disease is curable in almost 100 percent of the cases. (Brunschwig, A.: Cancer 7: 1182-1184, 1954. Dunn, J. E., et al.: J. Nat. Cancer Inst. 23: 507-528, 1959.)

*In the treatment of cancer*, modern therapeutic trials must be undertaken to test the traditional concepts of operability. There is no convincing evidence that radical mastectomy yields better results than the simple mastectomy for breast cancer, and a comparison of the operations is overdue by a decade. If no significant difference can be demonstrated, 20,000 women each year would be managed more conservatively and gently. (Shimkin, M. B., et al.: Surg. Gynec. & Obst. 94: 645-661, 1952. Smith, S. S., and Meyer, A. C.: Am. J. Surg. 98: 653-656, 1959.)

## A CURRENT LOOK

# VD

## AT VENEREAL DISEASES

The fight on venereal disease has reached a turning point, according to authorities attending a series of seminars on venereal disease conducted by the Public Health Service in major urban areas during the spring of 1960.

The knowledge and skills are available, they conclude, to reduce syphilis and gonorrhea to the point where public defenses need be only nominal, if strong measures are applied within the next few years. Unless such action is taken promptly, however, they believe the recent increase of venereal disease may become seeded throughout the population. And this increase may be speeded as the microbial agents grow to resist present forms of medication. The public is threatened also by the tendency of each infected patient to expose four others, on the average, and by a modern moral and technological climate which tends to sanction if not encourage such promiscuity.

Granting that a change in the pattern of sexual activity is less likely to occur than a change in public health practice, it was con-

cluded that, until immunization methods are discovered, the best hope of controlling venereal disease is to apply Dr. Thomas Parran's classic formula of diligent and systematic methods of finding persons with infectious syphilis and bringing them to treatment before they expose four others.

For the time being at least, venereal disease can be cured promptly by medical treatment, using simple, painless methods. But except for the development of attitudes which discourage promiscuous sexual habits, the only way to prevent venereal infection today is to find and treat carriers of the germs.

Expedited casefinding using all available community resources is essential to effective control. Much depends on the voluntary appearance of patients for treatment and their willingness to name associates and contacts.

For all the time that goes into locating potential patients, and interviewing, testing, and treating them, casefinding is a small price to pay for preventing the infection from going

to extremes. Major economies in finding cases could be achieved if physicians reported all presumably infected patients to health departments; if courts required tests of all persons arrested; and if hospitals and laboratories routinely reported positive findings in the more than 13 million blood tests performed annually.

Recommendations of the conference in Chicago in April 1960 emphasized the following points:

- With more than 13 million serologic tests processed annually in the United States, reports from all private and public laboratories would help health agencies to check with physicians to assure adequate treatment of all patients and epidemiological investigation of all infectious cases.

- If every patient with infectious syphilis were treated as an emergency and interviewed promptly, contacts, suspects, and associates could be pursued with the greatest possible rapidity. In this procedure, the telephone would be the primary reporting tool followed immediately by an epidemiological report.

- The telephone should be used especially to initiate and expedite investigations of contacts or suspects who are outside the jurisdiction of the primary investigator.

- Hospitals which do not perform routine blood tests upon admission could be encouraged to do so, perhaps by supplying them with tubes, needles, and other necessary equipment at public expense, as necessary for this purpose.

- In the attack on venereal disease, all community resources and all professional skills available are needed and should be used.

- There is a need for serologic screening of ships' crews, arranged by international action, with financial support available to port areas to deal with the threat of infection among the host of mobile and transient visitors. Opening of the St. Lawrence Seaway specifically suggests the opportunity for visitors to seed new chains of infections at inland ports, in the absence of hygiene or sophistication.

- A plea for more effective cooperation by private physicians suggested that physicians order serologic tests for syphilis whenever indicated, give alert attention to early infectious lesions, report all cases diagnosed and treated, report promptly and interview patients with

a positive STS recorded on their hospital charts, and refrain from unnecessary treatment of patients with a positive STS and a history of previous STS or treatment. It was observed that although State health departments differ in recommendations for treatment, "none advises total dosages as great as 10 million units of penicillin for asymptomatic syphilis or repeated treatments because of persistent positive STS in patients treated for late syphilis."

It was proposed that medical schools in at least a few hours of didactic instruction provide reasonably uniform information about the importance of histories in syphilis, the interpretation of serologic tests, and general principles of treatment.

A popular view, if not a consensus, was that eradication of syphilis in the United States is a practical goal; that efforts should be concentrated on casefinding for control of infectious syphilis; that participation by private physicians is essential to effective control; that special studies should be directed toward the epidemiology of venereal disease among young people; that informational and educational efforts should be intensified; and that research and demonstration should be encouraged to assist diagnosis of gonorrhea in the female.

## Current Status of Syphilis In the United States

WILLIAM J. BROWN, M.D.

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Communicable Disease Center,  
Public Health Service*

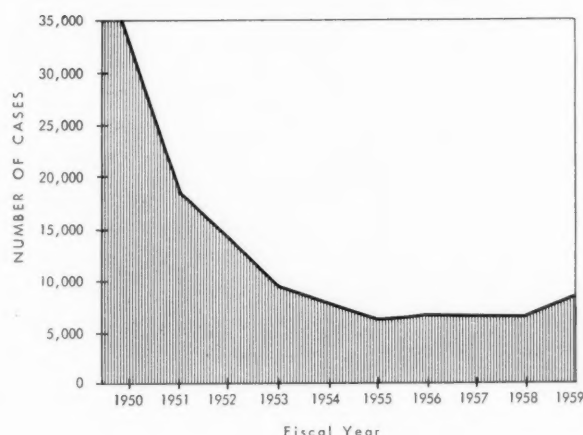
Syphilis remains a public health problem of major and increasing proportions.

A total of 120,000 cases were reported among civilians alone in 1959, of which 8,200 were in the early infectious stages (fig. 1).

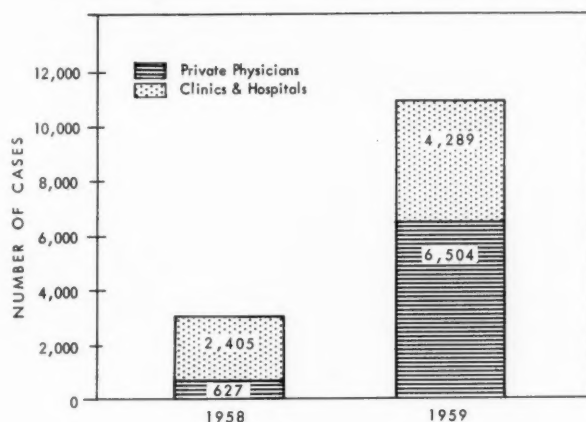
Reported cases of infectious syphilis have been increasing alarmingly since 1957. Moreover, there is no indication that the trend is changing. Almost 42 percent more infectious syphilis was reported from July to December of 1959 than was reported during the same 6 months of the previous year. We estimate the



**Figure 1. Primary and secondary syphilis cases reported in the United States, 1950-59**



**Figure 2. Primary and secondary syphilis cases reported by private physicians and clinics and hospitals, Pennsylvania, 1958-59**



reservoir of untreated syphilitics today at 1,200,000 cases and that the true annual incidence is 60,000 cases.

Already the cost of 33,000 paretics in tax-supported mental institutions is \$48 million a year. And if we do not find and treat the 1¼ million untreated, we may expect an additional 178,000 to develop late disabling manifestations. This will include 52,800 more cases of paresis and meningovascular syphilis requiring about 530,000 years of hospitalization at a cost of almost a billion dollars. It will also include 23,000 cases of tabes, 6,000 of optic atrophy, and 91,000 of cardiovascular syphilis.

Clearly, at this point syphilis is not under control. This is not to say that we have not made progress against syphilis in this coun-

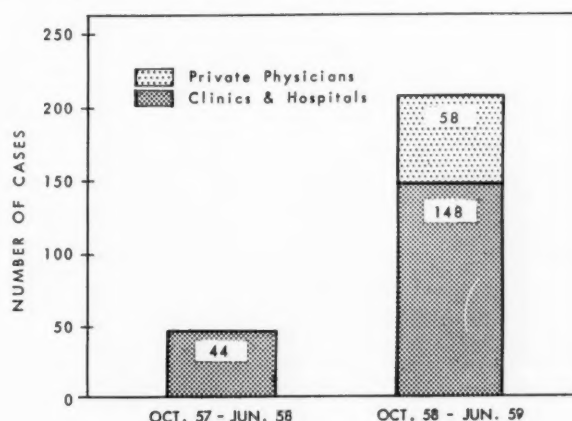
try, because we have. For example, deaths from syphilis have dropped from 14,000 to 4,000 a year, and infant deaths due to syphilis have dropped from 574 to fewer than 1 per 100,000 live births.

Fortunately, syphilis, for several reasons, is not spreading in geometrical progression, but it does seem to be spreading faster than we can find and treat it. A variety of factors, such as environment, economics, and social structure, may influence the spread of syphilis in a population. Some syphilitics, for example, do not have opportunity for further intercourse while they are infected. Moreover, syphilis is not contracted at every exposure to infection. And also, some chains of infection and chains of contact double back on themselves in large part and are contained within certain social groups.

Venereal disease control always has depended upon research to develop techniques of diagnosis and treatment, and upon a vigorous case-finding program to find infected persons and bring them to treatment faster than infection could spread. I believe that the late Dr. Joseph Earl Moore, in paraphrasing Frost on tuberculosis, was correct when he said, "... it is not necessary that transmission be immediately and completely prevented. If, in successive periods of time, the number of infectious hosts is continuously reduced, the end result ... if continued long enough, must be the extermination of the treponeme of syphilis."

Today, techniques of both diagnosis and

**Figure 3. Primary and secondary syphilis cases reported by private physicians and clinics and hospitals in Louisiana during two corresponding 9-month periods, 1958-59**



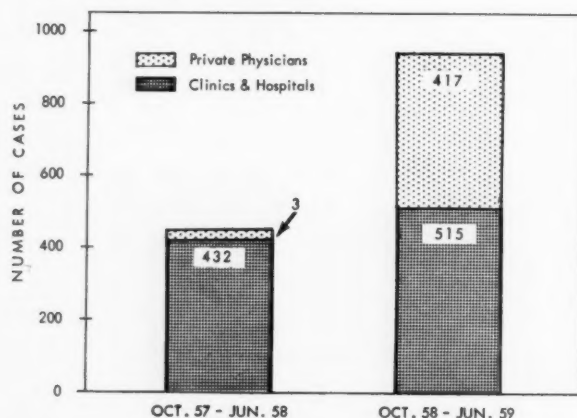
treatment have been developed almost to the ultimate. Epidemiology, however, has lagged behind, particularly among patients of private physicians. Consequently, a large part of our national program is now being oriented to the development of working relationships between public health and the private practitioner.

We have had some measure of success in persuading private physicians to report their cases and to have them interviewed by a trained epidemiologist. The Pennsylvania program is a good example. Reporting by private physicians in Pennsylvania increased more than 10 times from 1958 through 1959 (fig. 2).

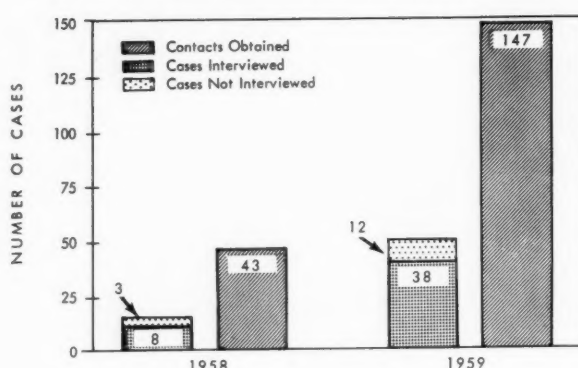
In 1958, the Louisiana State Health Department began to stimulate reporting among private physicians through personal visits, talks at medical society meetings, and followup of reactive serologies from public and private laboratories and hospitals. The results are shown in figure 3. In two corresponding 9-month periods, cases of primary and secondary syphilis reported by private physicians rose from 0 to 58. During the same two periods, early latent cases reported by private physicians increased from 3 to 417 (fig. 4).

Kansas is another typical example of improved interviewing among primary and secondary syphilis patients of private physicians. Morbidity reporting of early lesion syphilis treated by private physicians in Kansas rose from 11 cases in 1958 to 50 cases in 1959 (fig. 5). Further, the number of privately treated pa-

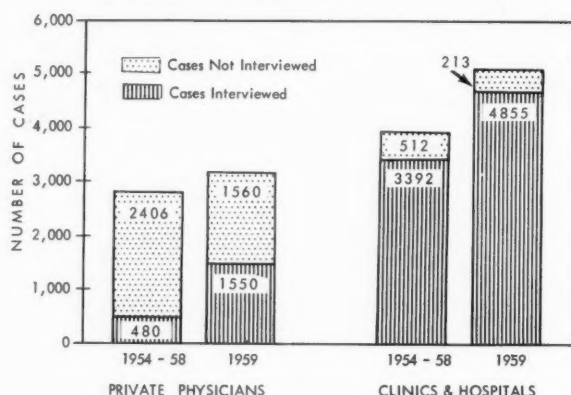
**Figure 4. Early latent cases of syphilis reported by private physicians and clinics and hospitals in Louisiana during two corresponding 9-month periods, 1958-59**



**Figure 5. Results of contact interviewing of primary and secondary syphilis patients treated by private physicians, Kansas, 1958 and 1959**



**Figure 6. Contact interviewing of primary and secondary syphilis patients treated by private physicians and in clinics and hospitals, United States, yearly average, 1954-58, and 1959**



tients with primary and secondary syphilis who were interviewed during the same period increased from 8 to 38. As a result, contacts of private physicians' patients who were interviewed increased from 43, in which there were no cases of infectious syphilis, to 147, which included 14 with primary and secondary syphilis.

Overall improvement has been made in interviewing privately treated primary and secondary syphilis patients across the country as shown in figure 6. In the 5-year period ending in 1958, an average of 17 percent of these patients were interviewed per year by a trained interviewer. During 1959, this percentage was still increasing. Forty-nine percent of all patients with infectious syphilis reported by private physicians were interviewed for sex contacts by a trained interviewer.

From the standpoint of epidemiology, success with the patient treated by a private physician equals that of the public clinic patient.

One question with respect to syphilis morbidity is raised sooner or later: Are these increases "real" increases in incidence, or are they only the results of improved casefinding and reporting? As we see it, increased morbidity at this point reflects both increased incidence and improved reporting. But we have no way of knowing how much is attributable to either.

However, there is one answer to this question. Regardless of what morbidity reports represent, the patients are real, they need treatment, and their contacts need examination. This cannot be denied.

In fact, it may be expected that if our present efforts continue successfully, as I have every hope that they will, morbidity figures will go a lot higher than they are now. But, sooner or later, a point will be reached after which any amount of epidemiological effort can result only in a plunge toward eradication.

## Casefinding in Chicago

**PHILIP R. WACTOR, Jr.**

*Health program representative,  
Chicago Board of Health*

In Chicago, 27 E. 26th Street is an address of unique reputation. It is the Municipal Social Hygiene Center, under the direction of Dr. K. B. Muir. Since 1938, the center has played host to 3 million or more guests who have entered for diagnosis, interviews, treatment, and checkups. Its files hold records dating back to 1934 of 800,000 male patients and 700,000 females, with medical charts of the histories of victims of syphilis.

In a neighborhood which blends, in Chicago style, the slum in retreat, industrial monuments in transition, and modern public housing projects in progress, a fence of iron spears protects the center's spacious and dignified quarters, declared unsuitable for use as a school building 20 years ago.

Here, with limited facilities and personnel, financed by local, State, and Federal funds, a dedicated staff carries on a running battle with

the social and microbial agents of venereal disease.

Not all the patients have venereal disease. Many are negative. They may have almost any form of skin disease. Dr. Seymour Weinstein, chief consultant, has even found a few cases of Hansen's disease among them. Many come in of their own accord. But the bulk of the visitors are invited in through epidemiological investigation.

Consequently, the bearing of most of those who climb the stairs to the registration desk is not happy. Although the receptionist is cheerful and smiling, her brightness touches few of those who wait in the large central reception hall. Thirty or more at a time drape the benches or squat on the hallway stairs. They pay scant attention to the informative exhibit on the south wall. They seldom read leaflets, books, or even papers.

They only sit and wait while the record clerks check their registration cards against the alphabetic file of previous visitors, the phonetic file of names reported by private physicians, and the numerical file of patients with syphilis.

If any are cheerful, they are the few directed to completely separate facilities for receiving, examining, interviewing, diagnosing, and treating expectant mothers, children under 2 years of age, and couples seeking the required premarital examination.

For the patient, the routine of diagnosis, interview, and treatment is an occasion for personal anxiety and relief. For the staff, it is a process which arrests or interrupts the career of agents which, undeterred, could reach from every promiscuous contact to thousands of innocents. The staff sees 5,200 patients in a month. In a year, they treat more than 16,000 cases of gonorrhea. In 1959, this one center reported 7,083 patients with syphilis.

The visitor who brings his chart number is ushered in for a checkup without delay. Others are summoned, by number only, over a loudspeaker system. No names are used.

There are several rooms for diagnostic service, containing private dressing booths and examination facilities. Before treatment, patients diagnosed as positive are called to the second floor for an interview. Each interview



is held behind closed doors. Although the booths are open at the top and far from sound-proof, so much conversation goes on at once that the only distinguishable remarks are those within a booth.

All interviewers are male. It is found that patients are likely to be more responsive to questions from a man. Women as a rule hesitate to admit promiscuity to another woman.

The attitude of the patients varies. Men as a rule are uncommunicative as to female contacts in relation to gonorrhea. They show little or no concern as to those they may have infected. No effort is made to interview women with gonorrhea, as it is felt little is to be gained: the men infected will show up for treatment in any event, soon after they are infected. In 1959, the center treated 16,000 patients, mostly men, for gonorrhea.

Dr. Weinstein is hopeful that the use of fluorescent antibodies may facilitate the prompt diagnosis of gonorrhea in women, with the possibility of detecting and arresting most of the social foci of that infection. There will remain, however, the present difficulties of finding female patients with gonorrhea and bringing them to treatment, since the woman is usually unaware of the infection in its early stages.

#### **More Cases and Greater Efforts**

While scholars hope to reduce venereal disease to the point where it is no more of a public health threat in America than malaria, the center's physicians, epidemiologists, investigators, and aides are dismayed at the rise in the incidence of syphilis.

While the rise in the reported cases of syphilis is in part a result of the superior epidemiology performed at the center, the staff is certain that the increase is also real. This conclusion is based on an increase in the rise of early infectious syphilis and on an increase in the number of positive reports in routine serologies from sources where there has been no special effort at casefinding and reporting.

Dr. Muir takes special pride in the industry, enthusiasm, and proficiency of the epidemiological staff, the "peppy epi" boys, detailed to the city by the Public Health Service. There are four on duty now.

In one year, despite a reduction in staff, the investigators, by improvements in the technique of cluster testing (the contacts, the suspected contacts, and the associates of patients with infectious syphilis), scored impressive gains in the number of infectious cases found and treated.

For the first 6 months of fiscal year 1959, they had 48 source patients with infectious syphilis. In 6 months of the following fiscal year, there were 169 source patients (table 1).

With the increased range of investigation, they found 25 cases of primary and secondary syphilis in the 1959 period, and 116 in 1960. Moreover, 41 of the cases in 1960 were in suspects or associates, cases which would not have been discovered in the infectious stages were it not for the technique of cluster investigation.

The epidemiological service has lost no opportunity to turn up unsuspected cases. A house-to-house survey in a high-incidence neighborhood has succeeded in bringing in 465 patients for treatment, out of 4,338 reactors. Of this number, 23 were infectious syphilitics.

Two other members of the staff are assigned to encourage physicians to report positive diagnoses promptly to the center. One of their special duties is to explain the need for prompt confirmation of a diagnosis reported as positive by hospital or laboratory tests.

Efforts to obtain reports from hospitals and laboratories have succeeded in bringing in reports on 94 percent of the tests administered in the city. In the event that a dark-field examination reveals the spirochetal organism from a lesion, the center is notified immediately. Otherwise, reports of positive diagnoses for the most part are filed monthly.

Hot pursuit of infectious patients is cooled somewhat by an arrangement which obliges the center to defer investigation of private patients reported as positive by laboratories or hospitals. None are interviewed until the patient's physician confirms the diagnosis, and such confirmation waits as long as 2 months. A less significant cooling effect results from the tendency of hospitals, for administrative reasons, to send reports of positive reactors to the center only once a month rather than daily.

Since in the normal course of events a patient may not appear for diagnosis and treatment

until weeks or months after infection, the search for fresh contacts of infectious syphilis begins with a handicap.

Other factors also interfere with detection of infectious syphilis in the early stages. A few patients develop no apparent symptoms. Often the lesions are not in an obvious location. Some develop internally or in obscure positions where even the patient may ignore them. If the lesions are less than classic, the diagnosis may be missed by physicians who have had little or no experience with the disease in recent years.

With the decline in the incidence of syphilis, the staff finds that not all physicians are appreciative of the implications of a positive blood test, or alert to the nature of a rash or sore which may disappear. Leaning with assurance on the efficacy of antibiotics, a physician may be inclined to develop a low index of suspicion, in the opinion of some authorities. During several interviews concerning cases of congenital syphilis, the mothers asserted, "I told the doctor I had this sore, but he said it would go away."

An experienced syphilologist, Dr. Muir is concerned also with the possibility that treated cases of syphilis may relapse. The center physicians seek to persuade patients to return

for a 'checkup at least once a month for 6 months, and to call again, at wider intervals, for at least a year. Recrudescence of the infection was a characteristic of the disease under earlier forms of treatment, and Dr. Muir feels that this characteristic may persist even under antibiotic treatment.

Her fingers are crossed also lest the incidence of anaphylactic reactions to treatment increase before the disease is eradicated.

Still another obstacle to eradication of the disease is its appearance among men and boys who associate mainly with their own sex, although they compose a major reservoir of infection for both sexes. The relations of such deviates are characteristically promiscuous; one 13-year-old boy named 40 contacts. Another who kept a diary named 38 in one year, and in a succeeding year named 44 others, with no repetition of any of the earlier names. Such contacts, many from the privileged ranks of society, now contribute the majority of those investigated. They lead at the same time to many heterosexual infections.

It is not certain that such patients have a higher incidence of infection than in the past, but the staff believes that the increase in reported cases to a great extent represents a true rise in the incidence.

**Table 1. Cluster test progress report, Chicago, Ill.**

Item	48 source patients, first 6 months fiscal year 1959			169 source patients, first 6 months fiscal year 1960		
	Contact	Suspect	Associate	Contact	Suspect	Associate
Names obtained.....	220	153	279	909	396	421
Located and examined.....	161	125	275	701	336	421
Positives.....	50	28	32	234	85	27
Infected with syphilis.....	49	28	20	234	85	27
Brought to treatment.....	32	16	7	118	41	17
Primary and secondary.....	19	5	1	75	26	15
Early latent.....	11	7	1	37	13	1
Other syphilis.....	2	4	5	6	1	1
Returned to treatment.....	0	2	1	2	1	0
Adequately treated.....	17	10	12	114	14	10
Not infected with syphilis.....	112	97	255	467	251	394
Not examined.....	59	28	4	208	60	0
Indices:						
Contact index.....	4.58	3.19	5.81	5.38	2.34	2.49
Epidemiological index.....	1.02	.58	.42	1.38	.50	.16
Brought to treatment.....	.67	.33	.15	.70	.24	.10
Brought and returned to treatment.....	.67	.38	.17	.71	.24	.10
Lesion to lesion.....	.40	.10	.02	.44	.15	.09
Percent reactive.....	31.05	22.40	11.64	33.38	25.29	.06
Percent located.....	73.18	81.69	98.57	77.11	84.84	100.00

Ordinarily, deviates are loath to report a venereal infection or to admit the source. The result is that they are more likely than heterosexual patients to go untreated and to seed infection widely. Apart from the dread of social contumely, they are fearful of criminal penalties. The Chicago investigators, however, by studiously disassociating themselves from police activity, have succeeded in winning their confidence to the extent that most cooperate willingly in reporting contacts and in helping investigators to find suspected contacts.

### The Routine and Some Findings

Typically, an investigator interviews 100 patients a month, all diagnosed as having infections.

If a patient has syphilis, the first step is a field trip by the investigator to the home of the contact, to locate and identify those who may live in the same place.

Ordinarily, except for the importance of a field visit to learn the associates of an infectious syphilitic, investigators pursue their leads by telephone or, if that does not avail, by telegram, for those over the age of 18. By these methods, they succeeded in bringing to examination more than 6,000 of 10,134 persons named in 6 months.

This record is scored despite the notorious reluctance or inability of patients to identify casual consorts. "A Jane on Cottage Grove" is typical of the identification offered. Often the contact's name is unknown to the informant, or it is a false name. On the other hand, the telephone number, if it is recent, will be correct, and the contact will answer to whatever name was given. The name itself, given in good faith, may need translation, as Scott may sound like Skort, Marion like Mann, and Terril like Tull. The spelling of such names also may be as free as the pronunciation.

The center does not deny treatment to patients who offer no personal identification. Any name and address they give is accepted, and it is purely a matter of conjecture how many are duplicates.

Patients use six or more aliases, sometimes without regard to gender. When patients are recorded by the Cook County jail, which tests and, if necessary, treats anyone arrested and

### Syphilis Diagnosis

"Recent publicity emphasizing the frequency of biologic false-positive reactions has made this diagnosis medically 'fashionable.' We join Perry, Kierland, and Magath in their insistence that a positive serologic test for syphilis should suggest a diagnosis of syphilis until proved otherwise."—DRS. GEORGE SCIPLE, C. HUNTER MONTGOMERY, and JOHN M. KNOX, *New England Journal of Medicine*, July 14, 1960, pp. 84-85.

detained for as little as 2 days, all the names by which a patient is known are recorded, and this information is used for the center's records. Such checks help an investigator to know whether a patient is a recidivist with established associations, or a fresh contact.

A technician at the county jail tests 50 to 100 a day, by the rapid plasma reagin method, relying on the patients for aid. Of the lot, 8.5 percent are found positive for syphilis. A similar arrangement for testing and treating is planned for the city jail.

There is no special category of crime associated with venereal disease except for the women who are arrested on narcotics charges. Most of these have resorted to prostitution in order to earn money for drugs, according to the staff. The investigators have the impression that, on the other hand, organized prostitutes use antibiotics liberally to cure or prevent infection.

The number of examinations for venereal disease at the center increased from 43,787 in 1956 to 122,169 in 1959, including the house-to-

**Table 2. Syphilis distribution in Chicago, 1959**

Type of case	Private patients	Hospital, clinic, or institutional patients	Total
Primary and secondary	209	537	746
Early latent	335	819	1,154
Latent	1,111	3,732	4,843
Congenital	46	294	340
Total	1,701	5,382	7,083



house survey. The number given preventive or curative treatment at the center increased from 5,951 to 7,608 in 1959. The number of infections found in Chicago increased from 21,635 in 1956 to 23,361 in 1959. Of this number, as noted, 16,102 were gonorrhea, 7,083 were syphilis, and 61, other venereal infections.

Of the syphilis cases, most in 1959 were latent, indicating failure of earlier diagnostic efforts (table 2). Most of the primary, secondary, and early latent syphilis patients were men.

The future of control of venereal disease in Chicago is under shadow of the seaway development. All of the ports on the Great Lakes for that matter will see an increase in visitors, including seamen, many of whom will come from lands where the incidence of venereal disease is still relatively high.

## **New Haven's Court Clinic: A Casefinding Source**

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In New Haven, Conn., the chief method of finding sources of venereal disease is the followup of all positive laboratory findings for syphilis, gonococcal infection, lymphogranuloma venereum, granuloma inguinale, and chancroid.

The Sanitary Code of the State of Connecticut, regulation 32, requires all laboratories to report promptly positive findings to the director of health of the municipality where the person affected normally resides, giving the name and address of the patient and the physician, with a duplicate copy going to the bureau of venereal disease, Connecticut State Department of Health.

The sources of these reports are premarital blood tests for syphilis of both partners; prenatal blood tests, mandatory in Connecticut since July 1, 1941; hospitals, where serologic tests for syphilis are performed on all patients on admission, many of which are given in emergency rooms; preemployment medical examinations, which although not required in

Connecticut, include serologic tests in some instances; private physicians; contact investigations; the health department's venereal disease clinic, including voluntary patients; and the New Haven court clinic.

The court clinic proved to be a fertile source of new patients with syphilis or gonorrhea and old patients needing treatment again. New Haven is the only municipality in Connecticut where persons arrested on vice charges are examined for venereal disease by the health department as a routine.

### **History**

The court clinic began July 13, 1942, at a meeting initiated by the Federal Bureau of Investigation, which was conducting a survey of vice conditions in Connecticut specifically pertaining to organized prostitution. Several conferences were held with public officials, medical authorities, and law enforcement officers.

On July 29, 1942, the health officer of New Haven, Dr. Joseph I. Linde, met with the local representatives of the judiciary, the police department, the county jail's staff, and members of the bureau of venereal disease of the health department to set up more effective machinery for the repression of prostitution and the control of venereal disease in New Haven.

Establishment by the health department of a diagnostic venereal disease court clinic was decided upon, and on September 17, 1942, the court clinic opened its doors. At that time, the law, in connection with court orders for venereal disease examinations, held that if there was no conviction, there would be no court order for examination. The health officer, however, could issue an order for examination if he had reasonable grounds. The clinic operated under this law for about a year with the full cooperation of the city court, the police department, the war council, and the council of social agencies.

Early in 1943, the State legislature made it mandatory, effective October 1943, for every individual arrested for an alleged morals offense, to be examined for venereal disease (section 739-g). This section of the statute was passed more or less as a war measure with

the approval and sponsorship of the Connecticut State Department of Health. At that particular time, as the courts were quite concerned about venereal disease, the law was adopted promptly. This court examination requirement has worked out quite satisfactorily.

### Procedures in Court Clinic

All persons arrested on a morals charge are examined by the court clinic doctor for evidence of a venereal disease prior to trial. On the morning following their arrest, they are brought to the court clinic for that purpose by a probation officer. Persons released on bond are told by the arresting officer or the desk officer to report to the clinic. If they fail to appear, the trial is postponed.

A blood test for syphilis is taken for both men and women. Cultures and smears for gonorrhea are done routinely on women, and on men if indicated. A physical examination is given with attention to the genitalia, mucous membranes, and skin for clinical signs of these diseases.

Records kept in detail show results of examination, charge on arrest, other pertinent

### Results of examination of court cases for venereal diseases, 1943-59, New Haven (Conn.) Health Department

Year	Number persons examined	Positive for syphilis		Positive for gonorrhea	
		Number	Percent	Number	Percent
1943	229	26	11.4	15	6.6
1944	221	38	17.2	30	13.6
1945	177	34	19.2	13	7.3
1946	172	29	16.9	23	13.4
1947	181	18	9.9	13	7.2
1949	257	22	8.6	21	8.2
1950	256	18	7.0	14	5.5
1951	269	17	6.3	7	2.6
1952	331	41	12.4	7	2.1
1953	369	25	6.8	17	4.6
1954	363	21	5.8	14	3.9
1955	426	32	7.5	13	3.0
1956	423	18	4.3	9	2.1
1957	382	41	10.7	42	11.0
1958	293	10	3.4	26	8.9
1959	384	23	6.0	16	4.2
Total	4,733	413	8.7	280	5.9

NOTE: 1948 data not available.

history, results of contact investigation, and disposition of case.

In addition, a report form (VD-13), in duplicate, is filled in by the clinic nurse and physician stating the history, laboratory findings, and recommendations. One copy is sent to court as part of the prisoner's packet through the city attorney's office, and after the case is terminated, filed at the city court clerk's office as part of the permanent file. Another copy is sent to the bureau of venereal disease of the State department of health.

The clinic interview usually provides the only opportunity for the nurse and physician to talk with the patient. At this time, information regarding contacts, previous history of venereal disease, and any other pertinent facts are taken in as much detail as the patient is willing to give.

If the laboratory findings are negative, the patient is notified and discharged from the clinic. When laboratory findings are positive, arrangements are made for treatment.

When a patient is found to have venereal disease, the report is given to the city attorney. This information is given so that the judge may place the person on probation or commit him, if requested by the clinic physician, in order that treatment may be administered. Patients are usually cooperative.

All contacts to cases of venereal disease found by the court clinic are followed in the same manner as other contacts. The court clinic is for diagnostic purposes only. The individual is afforded the choice of treatment either in the health department venereal disease clinic or by a private physician.

### Statistics

During the period 1943-59, excluding 1948 on which no data are available, a total of 4,733 persons were examined at the New Haven court clinic. Of this number, 413 (8.7 percent) were positive for syphilis and 280 (5.9 percent) had gonorrhea. All were placed under treatment.

Compared with the other two compulsory examinations, premarital and prenatal, the court clinic is proving to be an economical casefinding measure. A total of 400,392 premarital blood tests, performed by the State

department of health laboratories, yielded for the corresponding years only 3,679, or 0.9 percent, positive results. A total of 361,538 prenatal blood tests gave a positive percentage of only 0.4 percent.

These two blood-testing laws have definitely contributed to syphilis control, but examination of persons arrested on vice charges has brought to treatment more patients not only with syphilis but with gonorrhea.

The results of the court clinic clearly indicate that casefinding should be directed to those who are promiscuous.

The law dealing with premarital and prenatal examinations requires only a serologic test. Although a complete physical examination is recommended, the main emphasis is placed on the control of syphilis. The reservoir of undiagnosed gonorrhea in the female is one of the reasons why this venereal disease ranks second among reported infectious diseases in the United States. The court clinic, nevertheless, has been valuable in the detection of gonorrhea.

Establishment of the New Haven court clinic has also demonstrated that a health department with good leadership can, with the cooperation and joint effort of different agencies,

provide the community with effective venereal disease control facilities.

In all other municipalities throughout Connecticut, the court refers persons arrested on vice charges to private physicians for venereal disease examinations. Each physician is paid on a fee basis by the State department of health, as required by law.

The New Haven plan, with the health department primarily responsible for finding venereal disease, has the advantage of facilities necessary to follow up positive cases and possible contacts.

### Summary

The New Haven court clinic has proved to be a valuable venereal disease casefinding source.

There should be more emphasis on sustained venereal disease programs directed to groups of individuals who are known to be promiscuous.

All physicians should be aware of the fact that gonorrhea in females may be present and undetected unless vaginal smears and cultures are carried out.

Local health departments should take the leadership with cooperation of others in venereal disease control.

## National Water Pollution Conference

A vigorous discussion of water pollution problems was recommended by Arthur S. Flemming, Secretary of Health, Education, and Welfare, for the National Conference on Water Pollution to be held in Washington, D.C., December 12-14, 1960. The conference, which is receiving support of civic, industrial, and labor groups throughout the country, is expected to be attended by more than 1,000 of the Nation's leading professional and technical people in the field as well as by representatives of national organizations.

At a meeting of the conference's steering committee held in August, Secretary Flemming set two objectives for the conference: substantial agreement on national goals for water pollution control and the specific programs needed to reach these goals.

Surgeon General Leroy E. Burney pointed out that the United States is headed for a water crisis in the current decade unless the American people do a much better job of cleaning up the country's resources. The need for water supply and pollution control facilities "will continue to grow during the 1960's," he said, "as a result of population increases, the further concentration of people in metropolitan centers, and sharp increases in the use of water by households, farms, and industry."

Partly because of public apathy, the United States has accumulated a huge national deficit in these facilities, he said, warning that "we can no longer neglect this vital segment of the national economy without storing up serious trouble for the future. We need to apply more sanity to sanitation."



# THE VENEREAL DISEASE CONTACT INTERVIEW

A sensitive analysis of interviewing techniques used in social disease control as taught in the John Friend Mahoney Training Center for Nurses was presented during the Venereal Disease Seminar in Baltimore, April 29, 1959. A joint project of the Public Health Service and the Department of Health of New York City, the training center was founded in Brooklyn, N.Y., in March 1957 in response to the demand of public health nurses for more skills and knowledge in venereal disease control, a demand that mirrored rising rates of infection in these diseases. Participation in control activities by nurses in large cities had dwindled following the initial, spectacular success of antibiotic treatment and the innovation of interview-investigations.

The papers discussing the work at the center were delivered by Julius Buchwald, M.D., psychiatrist and consultant to the center; Josephine Omura, R.N., mental health consultant nurse with the Department of Health of New York City; Grace I. Larsen, R.N., senior nurse officer, Public Health Service, who is project director at the center; and Patricia I. Heely, R.N., director of the health department's bureau of public health nursing. Following is a compilation of these papers, in summary.

## **The Curriculum at the Center**

With the aim of making venereal disease control an integral part of the public health nurse's services, the John Mahoney Training Center for Nurses gives a 2-week refresher course monthly, September through June, stressing epidemiological principles and contact interviewing. Among the topics are: recent advances in therapy, laboratory aids and their interpretation, casefinding methods, the social and emotional implication of venereal diseases, and the relation between their control and other community services. Emphasis throughout is on the adolescent. Nursing, mental health, and medical consultants of the city health department and the Public Health Service teach through group discussions, lectures, and demonstration and analysis of in-

terviews. These experts are also available for student consultation.

During the first week, interviews are demonstrated by the project staff, and during the second, the nurses practice interviewing. Each interview is analyzed by the student group, under guidance of the staff and consultant psychiatrist. Evaluation of course components is constant for the purpose of improving teaching methods and program objectives.

## **The Indirect Interview**

The indirect interview has provided a valuable communication tool in many areas of medical and social investigation. It was in the natural course of development that this tool was

applied to communication with patients suffering from venereal disease. Just as the microscope, based on understanding of lenses and light, opened a new pathway for exploration of a heretofore invisible world, so does the indirect interview, based on psychiatric understanding, open a new pathway for exploration of human behavior. It is the behavior of the carrier on which the spread of venereal diseases depends. Any attempt to curb the spread of these diseases must necessarily cope with the subtle shadings and nuances within the character of the human vector. While the indirect interview is helping us to understand the motives, fears, character traits, and defenses of the patient, it also lights the pathway to successful contact finding, education, prevention, and cure.

The indirect interview is a purposeful interaction between two people, a conversation which follows a seemingly circuitous path through emotions, eventually finding its way to a nucleus of facts ordinarily unattainable. The foundation of the interview is a positive relationship which can best be defined in terms of the patient's impression of the interviewer. Such an impression would ideally include such phrases as: "She is willing to listen." "She seems to understand." "Perhaps this is the place I can be helped."

There are no dark secrets to establishing a positive relationship. Grandmother used to say, "If you get a person to like you, he will give you what you want." We may prefer using such terms as "obtaining a positive transference," "developing rapport," "building a sense of respect and confidence," but it all amounts to the same thing. We want the patient to like us and work with us toward a mutually gratifying goal, the eradication and prevention of disease.

The materials that build a positive relationship are as obvious as they are elusive. Ordinary courtesy, including a friendly smile and handshake, will never be outmoded. An introduction in which the interviewer offers his name and explains his position and function in the organization can help dispel anxiety. Although adolescents and children frequently are called by their first names, it is a good idea to address young and older adults by their last

names prefixed by Miss, Mrs., or Mr. The interview, other than the brief introduction, should not start or end in crowded corridors.

The patient's wish to maintain confidence can best be respected by starting the interview after the patient and interviewer are seated in a quiet, well-lighted, adequately furnished interviewing room. The walk to the room, however, does not necessarily have to be in tilted silence; an appropriate remark, such as "We can talk more comfortably here," can be made. This tells the patient that there will be talking and that the prying eyes and ears of outsiders are excluded. If the patient appears particularly guarded and cautious, it may help at the onset to say something like: "What we say here will be kept in complete confidence."

Opening remarks should be brief but should stimulate the patient to talk spontaneously about himself and his difficulties. With experience comes a natural ease and ability to say the right thing at the right time. For example, an opening statement may be: "Well now, I'd like to get to know something about you and perhaps learn if there is any way I can be of help. Can you tell me what brought you to the clinic?" Or the opening remarks may be determined by what the interviewer notices in the waiting room or on the way to the office. For example, if the nurse notices the patient conversing with someone while in the waiting room, she may ask, "Someone with you today?" In one interview conducted at the Mahoney Center, this question led the way to learning about a patient's relationship with his uncle. What was learned about the relationship gave us considerable insight into the patient's fears and needs and directed the course of the entire interview.

Another patient, while accompanying the nurse to the interviewing room, revealed a mild limp. Here an appropriate start could have been, "Having some difficulty?" On the surface, the patient may merely be explaining the physical difficulty, but in doing so he is giving the interviewer a wealth of information regarding his handicap, his ability to cope with difficult situations, as well as his reactions to candid questions from someone who appears concerned.

Professional workers frequently avoid reference to an obvious physical handicap of a pa-

tient, especially when the handicap is chronic. Quite the reverse is true when a patient appears with his arm in a sling. In a professional setting, reference to any handicapping condition can denote interest and concern on the part of the interviewer and could well be used as a means of fostering a positive relationship.

### The Expander Question

Expander questions during the interview offer another way of helping a patient talk spontaneously about meaningful and emotionally laden facts. The more a patient talks, the more he may want to talk, and the more he gets to like the listener.

An expander question differs from a direct question in several important ways. If you ask a direct question, you will get an answer, but that is all you may get. On the other hand, an expander or open-ended question opens a pathway to new facets of a patient's behavior and problems. Characteristically, a good expander question cannot be answered with one or even a few words. On the contrary, it forces the patient to probe, explore, confide, and learn. Where expander questions lead into emotionally laden material, they also uncover the most meaningful facts. Whereas the direct question usually takes its cues from isolated facts, the expander question takes its cue from feelings.

Examples of expander questions can be as numerous as there are varieties of situations which arise in the interview setting, but a question appropriate at one time, may be grossly inappropriate a few minutes later. Again, experience, intuitive capacity, and constant and full awareness of the patient's changing emotional tone are the best leads to the right questions asked at the right time. Opening questions such as, "Tell me about yourself," may be followed with, "What brought you to the clinic?" "Tell me more about that." "Are there other difficulties?" "I don't understand." "How do you feel about that?" "In what way?" "How does this show itself?"

Many times one or two words with the proper inflection and facial expression will do the job. For example, saying "Oh?" in response to a patient's statement may show interest and convey the message that you want to

hear more. Simply repeating the last word or words of a patient's statement can indicate your interest as well as pave the way for further thoughts on a subject.

Nonverbal expander questions guide us and therefore play an important role. An appropriate change in the angle of one's head, a lifting of an eyebrow, a well-timed smile, or an understanding expression of concern all can go a long way in helping the patient talk. Summarizing and clarifying what the patient has been saying can frequently focus a problem more clearly and aid in the exploration of new facts. For example, a patient talks of her problems in rearing four small children, meeting bills, frequent family illness, and the recent death of a relative. An appropriate expander at this point may be, "The going gets rough doesn't it?" Such a remark may lead the patient to further exploration of her emotional reaction to the events described, or, as sometimes happens, she may respond with, "Yes, but it's not always so rough." "Oh?" asks the interviewer; and, if the stage is set and the patient is ready, we may hear facets of the patient's life that are rewarding and make the "battle" worthwhile. The following example briefly compares the direct and indirect interview techniques. A patient has told the nurse that he recently came north to live. The direct interview would run something like this:

*Nurse:* When did you come north?

*Patient:* Six months ago.

*Nurse:* Do you like it up here?

*Patient:* Yes.

*Nurse:* Working now?

*Patient:* Yes.

*Nurse:* Do you like your work?

*Patient:* Yes.

*Nurse:* You have acquired your infection since you came up north?

*Patient:* Four weeks ago.

*Nurse:* What was the name of the girl?

*Patient:* I forgot.

The indirect interview may take this course:

*Nurse:* Then you have been living here only a short time?

*Patient:* Yes, I decided to come up 6 months ago.

*Nurse:* Oh? Tell me about that.

*Patient:* Well, my mother and father had



been separated since I was 13; I stayed with my mother until 6 months ago when she passed away.

*Nurse:* Oh! I see.

*Patient:* Yes, after she died I had no one else down there so I came up. I've been lucky. Got a good job, but it still gets lonely up here. I have no family here and do the best I can to make friends. I guess you have to take what you can get when you can get it. Seems its been like this a long time.

*Nurse:* Perhaps this feeling of loneliness is connected with the trouble that brought you to the clinic.

*Patient:* Maybe you have got something there. I have had this trouble before.

*Nurse:* Oh. Tell me about that.

*Patient:* Well, it was about 4 months ago. I was just kicking around and I met this fellow Joe who invited me to a party. When I got there . . .

This example, of course, is an ideal one. It implies that a relationship has been established and the patient wants to talk about himself. At the same time, it points to several problems that are characteristic of the indirect interview. First of all, this technique takes time. It is necessarily circuitous and brings in seemingly superfluous information. For that reason, time limits are necessary. We have found that setting a minimum time limit is as important as setting a maximum limit. Naturally, the maximum time you can spend with a patient depends upon the pressure of other responsibilities. Perhaps a 30- to 45-minute interview period can, for the start, provide an optimum amount of time for the exchange of thoughts. The minimum time limit can be considered as a margin of safety in coping with our own anxiety and tolerance of the interview situation. A resistant, provocative, hostile, or silent patient may frequently tempt us to terminate the interview prematurely. The patient, in spite of his outward resistance or hostility, will frequently view early termination as rejection and lack of concern on the part of the interviewer. Furthermore, it is frequently surprising and gratifying to find a seemingly fruitless 10-minute introductory period gradually evolve into a meaningful interpersonal experience.

The second problem raised by this technique

is the mounting tension and anxiety felt by the interviewer. As the tools and rigid framework of the direct interview are dropped, the interviewer frequently finds herself on unknown territory, facing facts and feelings she didn't plan to meet. To listen to a patient struggling for the right words to express hidden emotions is quite different from receiving brief yes and no replies to matter-of-fact questions. No doubt, there are times when we would all like to revert back to the good old question-answer format, sidestepping the vital issues that remain uncovered. Perhaps the knowledge that good interviewing does provoke anxiety may make it easier to recognize our inner tension when it appears. The knowledge that the effort will be more than repaid by hitherto unachieved rewards can perhaps make it easier to cope with the anxiety.

Another contributor to the interviewer's anxiety may be the fact that the subject of sex and venereal disease has always carried with it many overtones of social and personal bias. The relatively free discussion of these subjects in the open-ended interview taxes the interviewer's ability to cope with these ideas in a candid and unprejudiced manner. This does not mean that the interviewer is expected to be able to, or should, strip herself of personal feeling and taste, based on a lifetime of experience. It merely asks that the interviewer be aware of her own personal biases. By coming to grips with how she feels about a patient who has acquired a venereal disease, the interviewer will be able to consciously refrain from imposing such biases upon the viewpoint and attitudes of the patient.

Let us turn for a moment to the frequently expressed concern over what to do with the patient who opens up too much. The fear that the dam will burst by an overwhelming flood of human emotions provoked by the indirect interview technique is a chronic source of anxiety to the interviewer, especially the novice. Yet, experience has shown that the dam rarely floods and personality structure tends to inhibit rather than to give free rein to emotion. At this point, many of you may think, "Yes it does happen rarely, but it's just my luck that it will happen to me; then what will I do? How will I handle such a patient?" To this let us say that most of us have the intuitive capacity to

recognize the severely disturbed patient, curb our probing, offer occasional reassurance, and shorten the interview. In 2 years of experience at the Mahoney Center, there has been no instance in which the interview got out of hand. On the contrary, a patient frequently remarks that he "feels good," at the close of an interview. Almost always, the patient will let us know when we are "stepping on his toes" by his silence, shifting to other subjects, as well as using other defensive maneuvers which help the patient retain an emotional homeostasis. Our major efforts with this technique of interviewing rest in handling rather than fearing the absence of the patient's resistance.

Anything which hampers communication may be considered to be resistance on the part of the patient. It may be a thought which is difficult to express, a feeling which demands suppression, or a generally guarded attitude which has become part and parcel of a personality structure strained by a lifetime of probing and prying at the hands of punitive authority figures. The manifestations of resistance are multiple and demand considerable flexibility and adeptness on the part of the interviewer. A frequent form of patient resistance is silence. It is amazing how 15 seconds of silence can seem to be 15 hours. The resultant anxiety frequently tempts the interviewer to break the silence by changing the subject. Yet, since the silence represents an important thought which the patient finds difficult to express, valuable information may be gleaned if the patient, rather than the interviewer, breaks the silence. If a period of silence becomes overly long and provokes too much anxiety, the silence may be terminated by the interviewer asking, "What are you thinking?"

One sometimes meets a patient who candidly refuses to talk about a particular subject. Here an explanation of why the patient refrains can frequently reveal hidden problems, fears, and needs. Blushing and obvious embarrassment may make it necessary for the interviewer to offer reassurance. For example, a patient may be helped through a difficult moment by a statement such as, "I know that some of this is embarrassing to you, but I have come across these difficulties before and the more you tell me about it, the more I can understand and help." Ask-

ing for contact information, a focal point of the interview, is more likely to meet with a successful response if it is introduced after a positive working relationship has been developed between the patient and the interviewer.

Workers at the Mahoney Center have encountered a strange, misleading form of resistance. We are referring to the patient who enters the interviewing room, hardly waits for any introductory remarks, and quickly spurts out: "I think I know what you want. I caught the infection 5 days ago by having intercourse with Jane Doe who lives at 10 North Street. If you don't want to bother sending her a letter, I'll bring her in myself so she can be treated. Can I leave now?" Since this is all usually said in one breath, we may not have the time to realize that under the guise of golden cooperation, we have met iron-clad resistance. The inexperienced interviewer may well be tempted to close the interview at this point, feeling, "Why go on? He has told me what I want to know. What do I have to lose?" In actuality, closing the interview at this point means losing a great deal, for again, we would lose the opportunity to form a relationship with a patient who could potentially carry our message out to the community. This type of patient further reflects a dangerous, though presumably submissive, attitude, which will be discussed further.

#### Education of the Patient

The indirect interview and the relationship it promotes set a flexible, useful stage for the education of the patient. Perhaps in recalling experiences with learning, even on the elementary school level, there are few who do not remember the so-called "born teacher" who lives on in our memory as a good and wonderful person whose lessons were a pleasure to learn. We seem to learn most things for three basic reasons:

- To satisfy an instinctive curiosity, the epistemophilic instinct to which Freud referred.
- To profit from past experience for the purpose of self-preservation and the promotion of a happier future.
- To please and receive praise from a teacher we have learned to like.

Many patients will express a healthy curiosity about venereal disease, a curiosity which has heretofore remained unsatisfied. However, the freedom to express such curiosity is directly dependent upon the nature of the relationship, the absence of personal bias and prejudice, and the presence of helpful and refreshing candor. In answering questions, it is necessary to know the specific thought behind the question, as well as what the patient already knows. It is helpful, therefore, to meet a patient's questions with the question, "Why do you ask?" For example, a patient asks, "I guess the only way you can get this disease is when a man and woman have sexual intercourse." The interviewer is tempted to answer with a brief "Yes," but instead pauses and asks, "Why do you ask?" The patient is embarrassed, but now finds the courage to state, "Well, I didn't want to talk about this, but I haven't had any girl friends." Further exploration of this difficulty may lead the patient to submit the names of homosexual contacts, and if a conflict in his sexual behavior is discovered, perhaps he can be referred to appropriate sources for further counseling and help. Thus, the exploration of a patient's question will help reveal hidden facts, and will often bring to light conflicting and anxiety-provoking fantasies which require airing and resolution.

That learning about venereal disease is necessary for self-preservation may be an accepted fact to us, but the patient may not appreciate this as readily as we do. The indirect interview, having given us a fund of background knowledge as to the patient's problems and meaningful life experiences, now gives us the opportunity to demonstrate to the patient a connection between past difficulties and his present problem. For example, a patient told how as a youngster he had lost a finger in an accident while working on his father's farm. The fact that the accident occurred in a careless split second, but left a deformity that would endure a lifetime, gave the interviewer an excellent opportunity to connect the patient's experience with his present problem with venereal disease, as well as with his proneness to act impulsively and cause irreparable damage. It is connections such as these that help make learning meaningful and memory enduring.

Our third basis for learning takes us back to the relationship between the interviewer and patient. It is our hope that knowledge acquired within a nonpunitive and helpful setting will be incorporated within the day-to-day living habits of our patients. Just as we tend to forget unpleasant experiences, we tend to forget facts that have been learned under unpleasant circumstances. Facts that have been learned as a part of a positive experience during a successful interview may more readily be used when new situations in the patient's life demand recall of past experiences.

### Obtaining Contact Information

It is no accident that we ask for contact information toward the end of the interview rather than at the beginning. It is hoped that the positive relationship established during the interview will help the patient assume his responsibility in the situation by giving the information requested. Although it is not the purpose of the interview to offer psychotherapy, many patients have welcomed the opportunity to air their difficulties within the objective and nonjudgmental setting of the indirect interview. During the interview, the patient comes to recognize the interviewer as a helpful and responsible listener, a recognition which motivates the patient to assume the responsibility of providing contact information. Thus, we have tried to have the patient consider us as a source of help and to get him to like us. We have tried also to offer information of value to the patient, and we now expect that he will give us information that we need—contacts.

Finally, let us consider the matter of tactics and strategy in our war against venereal disease. Whereas the isolated casefinding, individual interview, and routine treatment of the patient constitute our tactical procedure, the strategy of our method must take into consideration an occasionally intangible but profoundly important attitude that has crept into the community and directly affected the potency of public health control efforts. At the Mahoney Center, we have had the opportunity to observe a community attitude that presents itself in subtle submissiveness, but rests on a hostile and fearful approach to authoritarian institutions.



This is an attitude characterized, in a sense, by the patient described before, who quickly offers the name of a contact (a name, by the way, which frequently exists only in the imagination of the patient) and wants no further part of a relationship with the nurse or the services she represents. The furtive responses of some patients who have come to get that needed "shot of penicillin" reflect the fact that something, somewhere has gone wrong. Also, when shame and fear remain attached to treatment and illness, there is another warning sign that our strategy is in need of repair. The patient who timidly seeks to bribe us with the name of a contact so that he may get treatment must feel that he is stealing something which is rightfully his and which he should be able to accept with

an uninjured sense of self-respect and human dignity.

Here, then, lies our strategic goal. At the Mahoney Center, we hope to improve our interviewing techniques so that the resultant positive relationship between nurse and patient may gradually be transferred to the relationship between community and social hygiene clinic. It is our hope that many individual interviews which provide a positive and helpful experience will lead the community to accept the clinic as a place where one can get help, considerate attention, and courteous guidance untinged by authoritarian or punitive demand. This is a long-term goal that requires continuous effort and study. It calls for hard work, but it is a goal that is well worth the effort.

### Resolutions Passed on U.S.-Mexico Border Health

Marking another year of creative, binational action to lift the level of health along the common border, the 18th annual meeting of the United States-Mexico Border Public Health Association was held April 4-8, 1960, at Hermosillo in the State of Sonora, Mexico. The meeting offered an agenda of papers and panel and roundtable discussions on subjects such as environmental sanitation, venereal disease, maternal and child health, tuberculosis, and poliomyelitis.

Among resolutions passed at the close of the sessions were those concerned with:

- The association's approval of development projects such as community water supply programs.
- Continuation of the interchange of experience and knowledge by public health nurses in the United States-Mexico border area.
- Recruitment of all other interested agencies and groups to work with the association toward the early eradication of tuberculosis in the border States.
- Continuation and broadening of the close cooperation between border health agencies in venereal disease control in all border com-

munities to further the training of health agency workers in venereal disease casefinding techniques and to increase the scope and efficiency of control programs.

- Further stimulation of specific training of nurses to aid in the early discovery and care of cases of infant diarrhea on the basis of oral rehydration and to assist in the promotion of local committees for the dissemination of information about these methods of controlling diarrheal disease.
- Encouragement of communities with a high occurrence of diarrheal disease to promote health and environmental surveys.
- Recommendations to officials along the border that they provide health workers with facilities for attendance and study at the association's annual meetings.
- Arrangement for joint publication of the proceedings of the association in the *Boletín* of the Pan American Sanitary Bureau, *Public Health Reports*, *Higiene*, and *Salud Publica de Mexico*.

A summary of other events of the meeting will appear in the December 1960 issue of *Public Health Reports*.

# A Reappraisal of Benzathine Penicillin in Gonorrhea Control

GEORGE W. SCIPLE, M.D., WILLIAM O. HOSKING, M.A., and C. HUNTER MONTGOMERY, M.D.

THOSE concerned with public health problems have been frustrated in attempts at reduction of the high incidence of gonorrhea. Penicillin therapy, combined with carefully perfected epidemiological procedures, resulted in a tremendous decrease in morbidity from primary and secondary syphilis. The utilization of the same drug, in conjunction with epidemiology modified to fit the needs of gonorrhea, has resulted in only a modest decrease in reported cases of gonorrhea over the last 10 to 12 years.

Recent attempts at solution of the problem of gonorrhea control have been based upon the modifications of epidemiological procedures and therapy. Efforts directed toward modifying the epidemiological procedures resulted in the adoption of what was known as "speed zone" epidemiology. When this approach failed to produce overall outstanding results, long-acting penicillin was added to the former therapeutic regimens to try to produce a period of "antibiotic quarantine" during which the patient could not be reinfected. The objective of this form of therapy was to decrease the incidence of gonorrhea.

Male patients of the venereal disease clinic of

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the Houston Health Department were treated with benzathine penicillin in addition to the usual procaine penicillin regimen, following in general a method reported by Hookings and Graves (1), for two purposes. The first was to find whether, by this means, male patients with gonorrhea could be adequately treated and effectively protected by an antibiotic quarantine against reinfection for 32 days. The second purpose was to determine the efficacy of the method in reducing the incidence of gonorrhea.

## Methods and Results

All male patients coming to our clinic for the first time with a clinical diagnosis of gonorrhea, except those sensitive to penicillin, were treated on one of four regimens, and are included in this study. Calendar periods during which the regimens were used were as follows:

Time interval	Treatment schedule	Number patients
Apr. 1, 1954, to Mar. 31, 1955.	600,000 units procaine penicillin with 2 percent aluminum monostearate in oil (PAM).	958
Apr. 1, 1956, to Mar. 31, 1957.	600,000 units benzathine penicillin.	1,075
Apr. 1, 1957, to June 1, 1958.	900,000 units PAM and 900,000 units benzathine penicillin.	1,331
Nov. 10, 1958, to Feb. 20, 1959.	1,200,000 units aqueous procaine penicillin and 1,200,000 units benzathine penicillin.	258

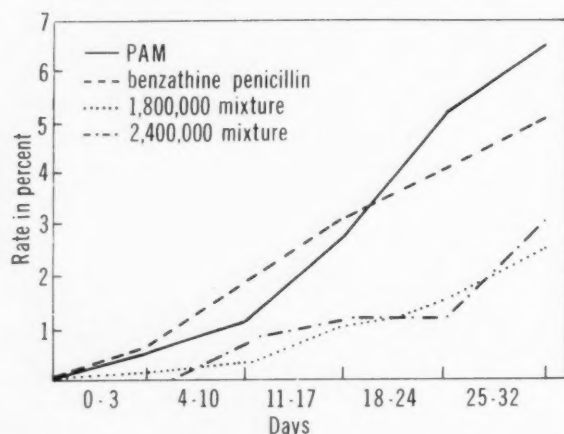
The patients were carried through our regular clinic routine. Contact investigation was carried out, and sex contacts were treated. No attempt was made to determine whether study patients had relapsed or were reinfected. Any

study patient who was again diagnosed and treated for clinical gonorrhea during the observation periods is considered a treatment failure.

During most of the period covered by this study, bacterial cultures were not available to us as a routine diagnostic aid. For this reason all patients were diagnosed on clinical findings and subsequently treated. When bacterial cultures became available late in this study period, we made a comparison between two groups of patients. One group consisting of 258 patients were diagnosed on clinical grounds; the other group of 448 patients were diagnosed on cultural grounds. We found no significant differences in retreatment rates between these two groups. Patients with nongonococcal urethritis composed only a minute fraction of men coming to our clinic for the first time with acute anterior urethritis.

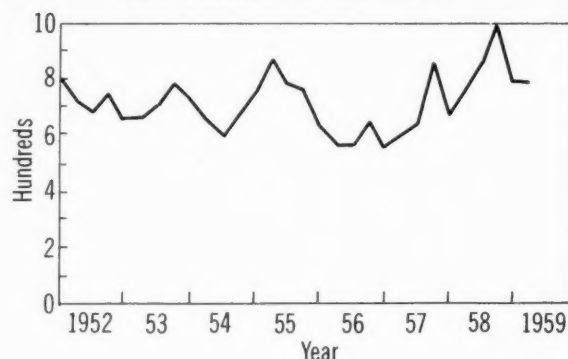
Retreatment rates for the first 32 days following therapy in the four schedules are shown in figure 1.

**Figure 1. Cumulative retreatment rates for 3,622 male gonorrhea patients in 32 days following therapy, Houston, 1954-59**



In brief, these data show the higher cumulative retreatment rates at the end of the 25- to 32-day period were with the single agents when used in smaller dosages. The lower retreatment rates were achieved by combining the short-acting and long-acting agents, with concomitant increase in the total dose given. These lower retreatment rates may be due to fewer relapses, fewer reinfections, or other intangible

**Figure 2. Gonorrhea morbidity, Houston Venereal Disease Clinic, 1952-59**



factors. These rates suggest that patients were indeed protected from reinfection by the period of antibiotic quarantine secondary to prolonged penicillin blood levels.

If this reduction in return rates is to be of more than academic interest, it must somehow affect gonorrhea incidence. In Houston we were unable to show any effect on incidence, because the actual incidence of gonorrhea is unknown, due to minimal case reporting by private physicians. We do have, however, exact figures for our clinic gonorrhea morbidity (fig. 2). We find no correlation between these morbidity figures and the application of our various treatment schedules.

Since we needed a means of evaluating the efficacy of these schedules, we extended our period of observation from 4 weeks (25-32 days) to 16 weeks. By so doing, we obtained an internal comparison of relapse/reinfection rates among the several schedules. With this extended observation period, the cumulative retreatment rates vary only from 13.89 percent to 17.42 percent between the several therapeutic regimens (fig 3). The maximal difference lies between two very similar schedules, both utilizing mixtures containing the long-acting drug.

When a study such as this is conducted over a long period of time, there is always chance that factors other than the controlled ones will influence results. During the period when the 2,400,000 unit mixture was administered, 19.3 percent more cases of gonorrhea were seen in the Houston clinic than in the time period when the treatment schedule was 600,000 units of PAM. It seems reasonable to believe that if the chance of acquiring gonorrhea in this popu-



lation was one-fifth greater during the time of treatment with a 2.4 million unit schedule than during the period of treatment with 600,000 units of PAM, then the chance of reinfection of those treated would also be one-fifth greater.

Adjusting the 16-week retreatment rate for this increase in probability of becoming reinfected, a retreatment rate of 14.06 is derived for the 2.4 million unit schedule, as compared with 14.00 for the 600,000 unit schedule. When this adjustment is made, the foregoing studies all show quite similar retreatment rates at the end point.

It is interesting to note that investigators in Great Britain have found retreatment rates comparable to those presented. Willcox reported retreatment rates of 14.8 percent at the end of 3 months in a group of white patients treated with an oral penicillin preparation (2). Dallas reported a treatment failure rate of 14.1 percent at 3 months in a series of 447 male patients treated with 300,000 units of procaine penicillin at St. Thomas Hospital, London (3).

Our data show that the use of benzathine penicillin in the therapy of acute gonorrhea in men offers no discernable long-term advantage to our gonorrhea control program. There are, we believe, several disadvantages to the use of this agent.

The most obvious disadvantage is the added cost of therapy with benzathine penicillin. It is several times that of an equivalent unitage

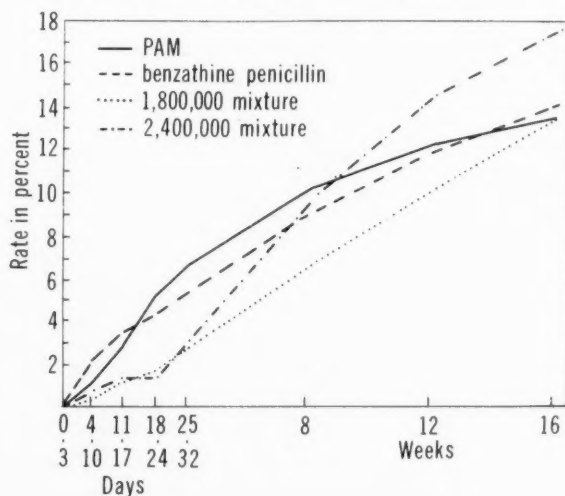
of procaine penicillin with 2 percent aluminum monostearate in oil, for instance.

Another and very considerable disadvantage to the use of benzathine penicillin is the persistent discomfort at the site of injection. This pain we believe to be severe enough to inhibit the patient's return to the clinic should he become reinfected. Perhaps the short-time failure rate is actually the same with all schedules, but the recent memory of persistent discomfort of the benzathine penicillin injection inhibits the return of patients who are treatment failures until, with passage of time, memory of pain fades while persistence of symptoms becomes worrisome enough to stimulate their return. This factor could well contribute to the "antibiotic quarantine." In addition, we suspect the associated pain may well drive our patients to sources of therapy, both legal and illegal, where no epidemiology is carried out.

We find that use of benzathine penicillin in men often tends to confuse the epidemiological picture in gonorrhea control. Most of our male clinic patients are aware of the short incubation period of the disease, but unaware of the period of antibiotic quarantine provided by the drug. When the patient returns to his unnamed, untreated, and still infected sex partner and is not almost immediately reinfected, he assumes her free of the disease. When reinfection does ultimately occur, he is unable to associate his reinfection with its actual source. Under these circumstances, patients are not easily persuaded to reveal the identity of their sex partners to the epidemiological investigator.

The chances for the development of penicillin-resistant strains of gonococci would seem to be enhanced when long-acting penicillin is given to promiscuous persons who are members of a socio-sexual group having a high gonorrhea prevalence. When persons with persisting low levels of penicillin in their blood are repeatedly exposed to numerous sexual partners, and consequently to varying strains of gonococci, it is likely that organisms which are penicillin resistant will eventually be selected. Such a situation would essentially reproduce the cultural conditions that are used in the laboratory to produce drug-resistant bacteria. Since there appears to be a theoretical possibility of promoting the evolution of

**Figure 3. Cumulative retreatment rates for 3,622 male gonorrhea patients in 16 weeks following therapy, Houston, 1954-59**



populations of drug-resistant organisms, this seems to us to be an added reason for not using the agent.

We have discussed several disadvantages to the use of long-acting penicillin in acute gonorrhea in men. The disadvantages, while considerable, might be tolerated if the use of long-acting penicillin provided compensating advantages in the control of gonorrhea. In Houston we have not been able to show any influence on gonorrhea morbidity, or in long-term retreatment rates through the use of this agent in men. We have, therefore, discontinued its use in men coming to our clinic with gonorrhea.

We are continuing to give long-acting penicillin to women. Takos and co-workers have formulated an epidemiological rationale for such therapy based on the differences in the natural history of the disease in men and women (4). In the vast majority of women, gonorrhea is asymptomatic, or nearly so, and they do not usually seek treatment voluntarily. For these reasons, the objective of the therapeutic schedule followed by these researchers is to cure the patient of her Neisserian infection and at the same time protect her from reinfection for about 6 weeks. In addition, Garson and Barton have recently discussed theoretical therapeutic advantages of treating gonorrhea in women with long-acting penicillin (5).

The therapeutic schedule used by Takos and co-workers in men was founded upon three assumptions: (a) the promiscuously exposed male urethra is the most effective casefinding tool known, (b) when a man becomes infected, he will be symptomatic, and (c) his symptoms will cause him to seek medical attention. Takos' male patients were treated with enough short-acting penicillin to effect a rapid cure, but care was taken not to give long-acting penicillin, with its resultant several weeks of antibiotic quarantine. The cured but still promiscuous man is swiftly returned to risk in his high-gonorrhea-incidence social milieu. His active libido and minimal inhibitions are thus utilized again and again to locate additional asymptomatic but infected women.

## Summary

Four different penicillin schedules were used in the therapy of acute gonorrhea in 3,622 men at the venereal disease clinic, Houston, Tex. The objective was to determine what effect the use of benzathine penicillin might have on the gonorrhea control program in Houston.

Patients treated with a mixture of long- and short-acting penicillin showed lower retreatment rates for gonorrhea during the first 4 weeks of the followup period. This was presumably due to an antibiotic quarantine against reinfection, resulting from the prolonged action of the benzathine penicillin. In the next 12 weeks of the followup period, it was found that those patients treated with mixtures containing long-acting drugs returned with gonorrhea at a faster rate than did those treated originally with a single drug. At the termination of the full 16 weeks' followup period, there was no appreciable difference in the cumulative retreatment rate on any of the schedules.

No correlation could be shown between the use of any treatment schedule and changes in gonorrhea morbidity at our clinic in Houston.

No long-term advantage to gonorrhea control could be demonstrated through the use of benzathine penicillin in the therapy of acute gonorrhea in men.

Several disadvantages, both practical and theoretical, to the use of long-acting penicillin in men with acute gonorrhea are discussed.

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# Treponemal Tests in Diagnosis of Syphilis and Biologic False Positive Reactors

NICHOLAS J. FIUMARA, M.D., M.P.H.

THE ERA of the treponemal tests began in 1949 with the introduction of the *Treponema pallidum* immobilization (TPI) test by Nelson and Mayer (1). The TPI test was followed in 1955 by the *T. pallidum* complement fixation (TPCF) test, developed by the Public Health Service (2).

The TPCF test has been almost entirely replaced by the Reiter protein complement fixation (RPCF) test established in 1957 (3-5). This test employs the protein fraction of the nonpathogenic strain of *T. pallidum*, originally described by D'Alessandro and his co-workers in 1949 (6,7). Since the Kolmer technique is used in the RPCF test, the procedure is also referred to as the Kolmer-Reiter protein complement fixation test (KRPCF). A new treponemal test, the fluorescein tagged antibody (FTA) test (8) is still under study and is not available for general use.

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*The RPCF and the TPCF tests for this study were performed under the supervision of Genevieve O. Stuart, chief serologist, State Wassermann laboratory. The TPI tests were performed under the direction of Dr. Irving H. Blank, department of dermatology and syphilology, Massachusetts General Hospital, Boston.*

There are three uses for treponemal tests: (a) to help distinguish between biologic false positive and true positive blood tests for syphilis; (b) to help establish a diagnosis of syphilis in patients who have clinical evidence of the disease, particularly evidence of late syphilis, but who have negative blood and spinal fluid serologic tests; and (c) to assist in the diagnosis of syphilis in patients with epidemiological evidence of the disease but with negative clinical and serologic findings (9,10).

The division of venereal diseases of the Massachusetts Department of Public Health performs both the TPI and RPCF tests at the request of private physicians and hospitals. The TPI test has been performed for patients of private physicians since 1955. The TPCF test was added in 1956 but was replaced by the RPCF test in 1958. Performance of these tests has given us an opportunity, as never before, to evaluate the incidence and prevalence of biologic false positive reactors in Massachusetts.

## Basic Medical Data

Physicians and hospitals who request a TPI or RPCF test are asked to complete a form which summarizes the results of the diagnostic workup to date. The following information is requested.

### History

Is there a history of syphilis? If so, how much treatment has the patient received, in what year, and where?

Is there a history of any venereal disease?



### Physical Examination

Is there any evidence of primary, secondary, or late symptomatic syphilis or sequelae of these stages?

Are there any stigmata of congenital syphilis?

### Diseases and Immunizations Causing False Positive Reactions

Is there any evidence of a disease commonly causing a biologic false positive reaction? (A list is given on the form.)

### Epidemiological Investigation

Give the result of your examination, including the blood test for syphilis on the patient's spouse, parents, children, or siblings, as indicated.

### Laboratory Tests

Record the results of at least two blood tests for syphilis.

Give the date of the lumbar puncture and the result of your examination of the spinal fluid, including cell count, total protein, and serology.

One or more of the above requirements are waived for good and sufficient medical and social reasons. For example, the lumbar puncture is not required in a pregnant patient, a patient with a "bad back," a debilitated patient, or a patient who flatly refuses to have a lumbar puncture done. Examination of the marital partner or other epidemiological investigations are postponed when the patient asks that his

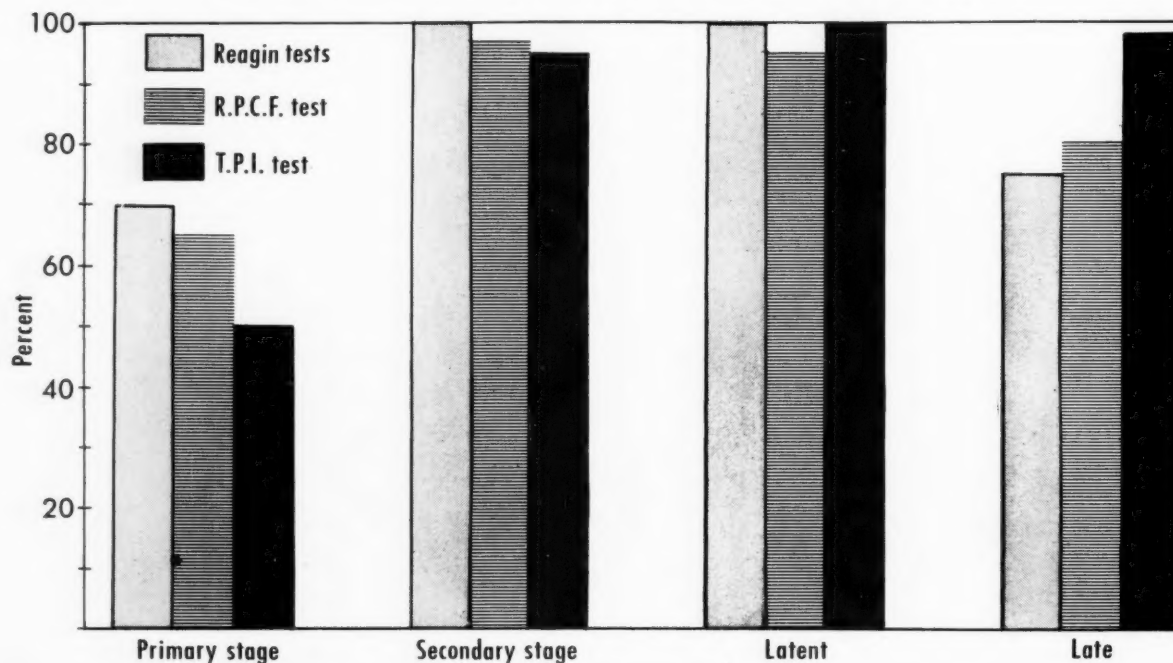
family not be tested at this time. No exceptions are made to the requirement that the results of at least two blood tests be reported.

On receipt of the completed summary from the physician or hospital, the division of venereal diseases makes an appointment with the State cooperating venereal disease clinic for the patient to have blood drawn for the TPI test because special techniques are required for this test. The clinic sends a split sample of the patient's serum to the Public Health Service Venereal Disease Research Laboratory at Chamblee, Ga., so that the same blood sample may be tested in two different laboratories. This procedure safeguards against laboratory errors, which are on the negative rather than on the positive side, and imparts greater reliability to the test results. From each blood sample taken for the TPI test, serum is saved for the RPCF test.

To each physician or hospital requesting only the RPCF test, the division of venereal diseases sends a laboratory slip which is to be completed and wrapped around a tube containing 8 cc. of clotted blood. This tube is to be mailed to the Wassermann laboratory.

All laboratories send reports of both the TPI and RPCF tests direct to the division of vene-

Figure 1. Sensitivity of reagin, RPCF, and TPI tests in untreated syphilis



real diseases. If there are no conflicts in the test results, the reports are mailed to the referring physician or hospital.

As experience with these two tests was gained over the years, the policy was adopted of using the RPCF test as a screening device on patients with reactive blood Hinton tests. If the RPCF test was positive, the diagnosis of syphilis could be confirmed, but if this test was negative, a TPI test was advised. Whenever a TPI test was done, the RPCF test was also performed.

### Sensitivity and Specificity of Tests

The physician is concerned primarily with determining whether a patient with a positive blood Hinton test does or does not have syphilis. For this reason, he must know the limitations of the treponemal tests. These limitations can best be described by comparing the sensitivity of these tests in the various stages of untreated syphilis with the sensitivity of the older Hinton test.

The RPCF test is more sensitive than the TPI test in early syphilis, where we don't particularly need a high degree of sensitivity, and less sensitive in latent and late syphilis, where we do want and need a more sensitive test (fig. 1). Thus, in primary syphilis, while the Hinton test is positive in 70 percent of the cases, the RPCF test has a sensitivity of 65 percent, the TPI test only 50 percent. In secondary syphilis, the Hinton test is always positive, but the RPCF test is positive in only 98 percent of cases, and the TPI test in 95 percent. In latent syphilis, the Hinton test is of necessity positive in all cases. The TPI test is practically always positive, too, but the RPCF test is positive in only 95 percent of the cases. In late syphilis, the Hinton test is positive in 75 percent of the cases, the RPCF test in 85 percent, and the TPI in 98 percent.

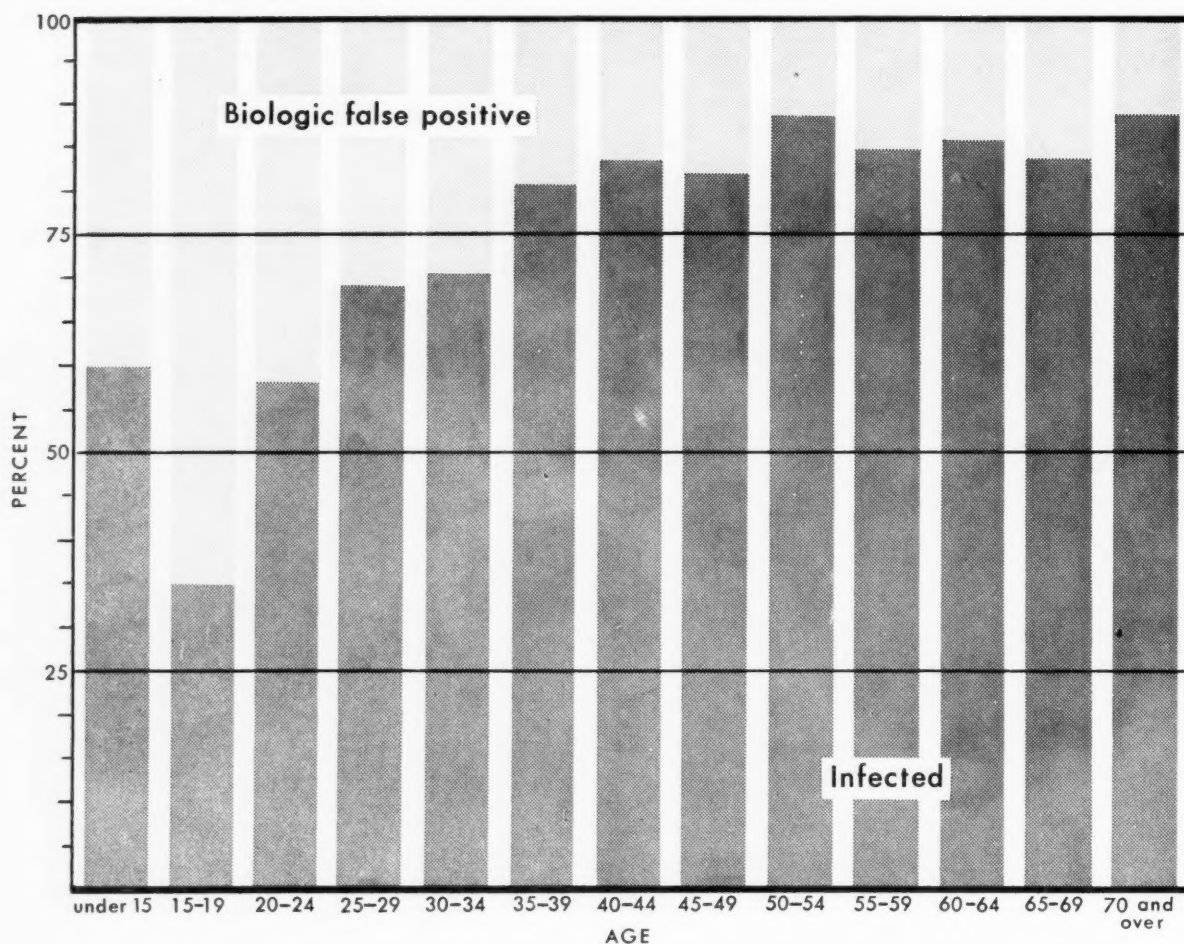
Although absolute percentages have been given to depict the level of sensitivity of these tests in the various stages of untreated syphilis, these percentages indicate only the average range of sensitivity. Any or all tests may vary from their assigned sensitivities in a given case and in accordance with the test technique used. Thus, in patients with a syphilitic

chancre of 1 day's duration, the blood test will be positive in only about 25 percent. At the beginning of the second week after infection, approximately 50 percent of such patients become seropositive. The number increases to 75 percent at the beginning of the third week and to 100 percent by the fourth week, by which time most patients exhibit signs and symptoms of secondary syphilis. Similarly, a patient with late secondary syphilis has a greater chance of having positive RPCF and TPI tests than one in the early secondary stage. Results of the treponemal test may not show the same level of sensitivity when different techniques are used or when different laboratories perform these tests, even on the same blood sample.

**Table 1. Syphilitic infection in 703 patients with positive reactions to the Hinton test, Massachusetts, 1954-59**

Classification	Total reactors	Infected	
		Number	Percent
Total-----	703	548	78.0
Clinic or private:			
Clinic-----	548	451	82.3
White-----	332	243	73.2
Nonwhite-----	216	208	96.3
Private-----	155	97	62.6
White-----	146	88	60.3
Nonwhite-----	9	9	100.0
Race:			
White-----	478	331	69.2
Male-----	231	176	76.2
Female-----	247	155	62.8
Nonwhite-----	225	217	96.4
Male-----	79	74	93.7
Female-----	146	143	97.9
Sex:			
Male-----	310	250	80.6
Female-----	393	298	75.8
Marital status:			
Single-----	169	114	67.5
Male-----	91	68	74.7
Female-----	78	46	59.0
Married-----	365	283	77.5
Male-----	172	139	80.8
Female-----	193	144	74.6
Widowed-----	78	66	84.6
Male-----	22	19	86.4
Female-----	56	47	83.9
Separated-----	53	51	96.2
Male-----	16	15	93.8
Female-----	37	36	97.3
Divorced-----	38	34	89.5
Male-----	9	9	100.0
Female-----	29	25	86.2

Figure 2. Results of treponemal tests of 703 patients, by age, Massachusetts, 1954-59



At the present stage of knowledge of and experience with the treponemal tests, a positive reaction, for all practical purposes, means syphilis or a treponemal disease, namely, yaws, pinta, or bejel.

#### Types of Cases Studied

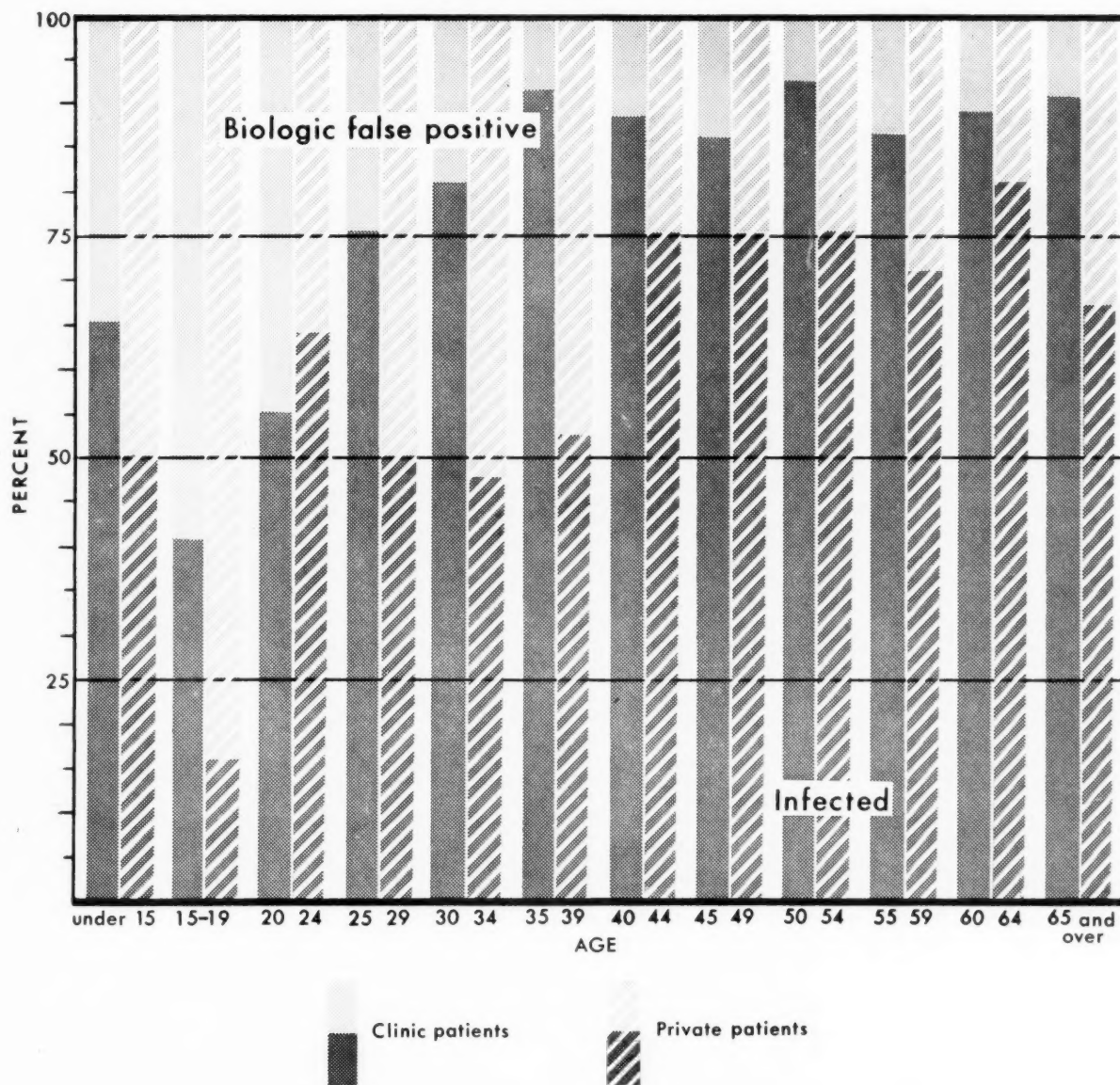
This report covers an analysis of 703 positive Hinton reactors who, on the basis of the study forms submitted by their physicians had no historical, physical, or epidemiological evidence of syphilis. Excluded are (a) patients who had clinical evidence of syphilis but who had either positive or negative blood and spinal fluid serologic tests, (b) patients who had epidemiological evidence of syphilis but had negative clinical and serologic findings, (c) patients who had had not only a positive blood Hinton test but also positive spinal fluid serology (a positive spinal fluid serology means neurosyphilis)

and whose TPI or RPCF test was positive too, and (d) patients who had an initial positive qualitative Hinton test but whose later quantitative Hinton tests were negative on at least two occasions. Thus, the study group is composed entirely of patients with persistent positive blood Hinton tests whose physicians could not decide whether or not they had syphilis.

Of the 703 cases studied, 155 (22 percent) were patients of private physicians and 548 (78 percent) were from clinics and hospitals. There were 478 (68 percent) white patients and 225 (32 percent) nonwhite. There were 310 (44.1 percent) males, and of these, 231 (74.5 percent) were white and 79 (25.5 percent) nonwhite. Females numbered 393 (55.9 percent), and of these 247 (62.9 percent) were white and 146 (37.1 percent) nonwhite. As regards marital status, 169 patients (24 percent) were single, 365 (51.9 percent) were married, 78 (11.1



Figure 3. Results of treponemal tests of 703 clinic and private patients, by age, Massachusetts, 1954-59



percent) were widowed, 53 (7.5 percent) were separated, and 38 (5.4 percent) were divorced.

#### Infection Rates

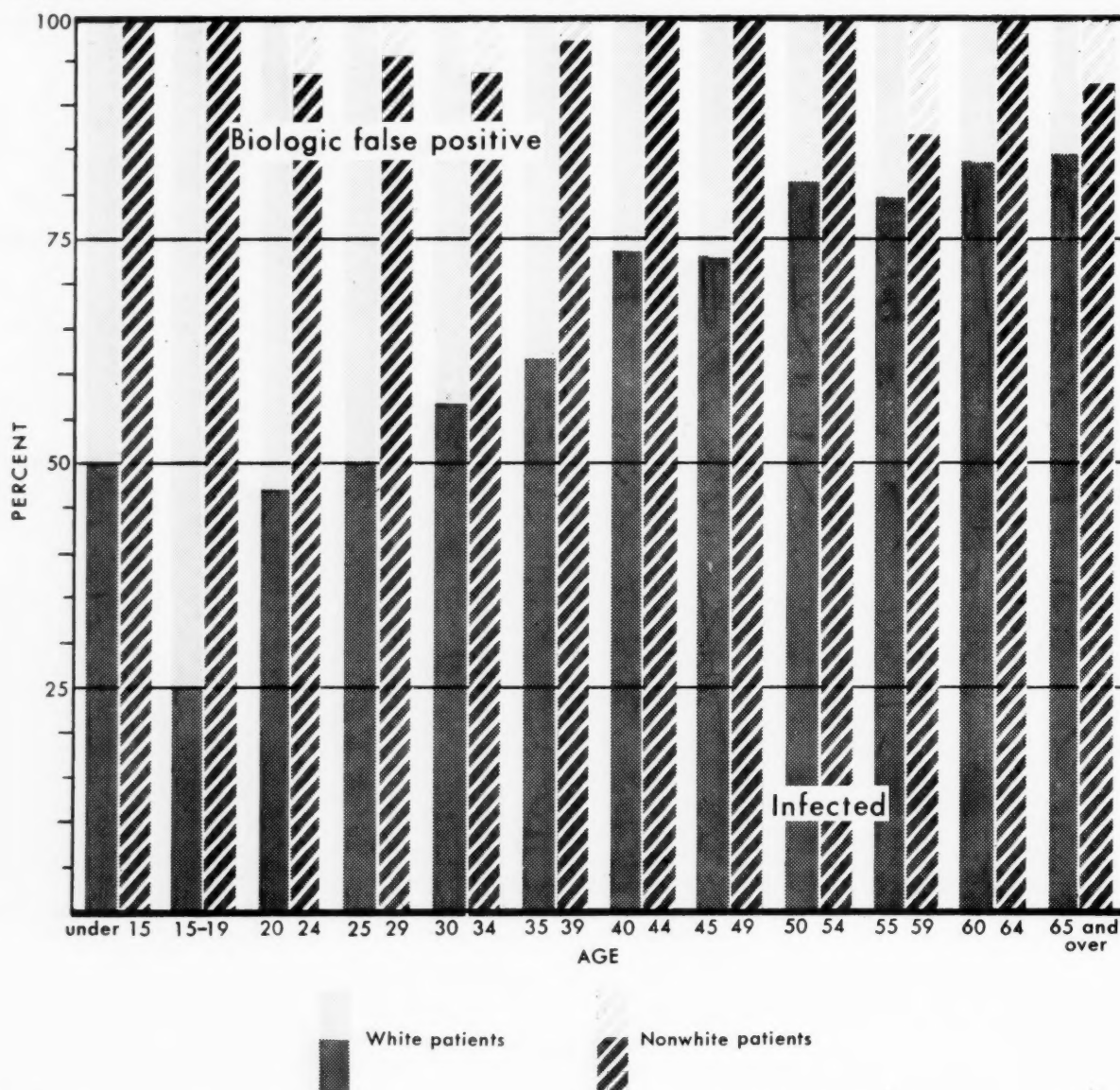
On the basis of a positive treponemal test, either the TPI or RPCF test, or both, 548 (78 percent) of the 703 patients were infected, whereas 155 (22 percent) were not infected, but had a biologic false positive reaction. The detailed data on infection are given in table 1.

Clinic patients were infected more frequently (82.3 percent) than private patients (63 per-

cent). Nonwhite patients had syphilis more often (96.4 percent) than white patients (69.2 percent) irrespective of whether they were clinic patients or patients of private physicians. Furthermore, the infection rate in nonwhites of both sexes was higher than in white persons. But the infection rate was about the same in males and females of the same race.

When the 703 patients were studied by 5-year age groups, an interesting pattern was seen. With the exception of the group aged 15-19 years, the infection rate increased with age up to about 45 years, when it tended to level

Figure 4. Results of treponemal tests of 703 patients, by race and age, Massachusetts, 1954-59



off (fig. 2). This pattern was seen in both private and clinic patients (fig. 3) and in white patients (fig. 4), but nonwhite patients in this age group failed to show the sharp decrease in infection rate.

The infection rate in both males and females followed the general trend of increasing infection with age, but with a sharp increase in the BFP rate in the 15- to 19-year age group. White males, and to a greater extent, white females, showed this sharp increase in BFP rate in the 15- to 19-year age group, but the infection rate in neither the nonwhite males nor the nonwhite females followed this pattern.

In general, the rate of infection was highest in the larger cities, particularly among patients of private physicians, and to a lesser extent, among clinic patients (table 2). The general policy of the State department of public health is that no patient be "closed out" as a biologic false positive reactor without the benefit of a treponemal test, even though the diagnosis is obvious.

Boston, the largest city in the State, had the highest infection rate (85 percent). Among census tract districts, the infection rate varied from a high of 100 percent to a low of 50 percent. Many of the districts with a

known high prevalence of syphilis also had a higher infection rate among their diagnostic problem cases.

When the data were analyzed according to individual referring hospitals, the infection rate among the 703 diagnostic problem cases generally reflected the prevalence of syphilis in the population group from which the patients came (table 3). In hospitals drawing their patients from areas with a high syphilis prevalence—Boston City Hospital and Massachusetts Memorial Hospital, for example—these diagnostic problem patients showed a

higher-infection rate than patients in hospitals in areas of lower syphilis prevalence.

Lastly, an attempt was made to correlate the highest dilution positive Hinton test with the diagnosis of biologic false positive reactor. The highest dilution positive titer recorded was 1:16, and this in one case only (fig. 5). In general, BFP reactors have low titer serologic tests, although exceptions to this have been seen by almost all physicians. But among these 155 BFP reactors, only 1 patient had a positive Hinton test at a dilution of 1:16; none in more diluted serum.

**Table 2. Results of treponemal tests on 703 positive reactors to the Hinton test, by type of patient and community size, Massachusetts, 1954-59**

Community size	Cases		Type of patient											
			Private				Clinic				Total			
			Infected		BFP <sup>1</sup>		Infected		BFP <sup>1</sup>		Infected		BFP <sup>1</sup>	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Boston <sup>2</sup> .....	400	57	31	69	14	31	309	87	46	13	340	85	60	15
100,000-.....														
149,999.....	7	1	2	40	3	60	1	50	1	50	3	43	4	57
50,000-.....														
99,999.....	124	18	28	72	11	28	62	73	23	27	90	73	34	27
All other.....	172	24	36	55	30	45	79	87	27	13	115	67	57	33
Total.....	703	100	97	63	58	37	451	82	97	18	548	78	155	22

<sup>1</sup> Biologic false positive.

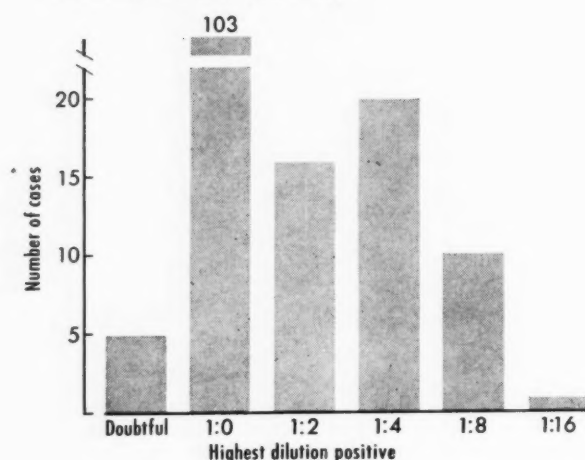
<sup>2</sup> Population 724,702.

**Table 3. Results of treponemal tests on 703 positive reactors to the Hinton test, by source of request, 1954-59**

Source of request	Total	Infected		Biologic false positive	
		Number	Percent	Number	Percent
Total.....	703	548	78.0	155	22.0
Voluntary hospitals.....	535	440	82.2	95	17.8
Beth Israel.....	14	9	64.3	5	35.7
Boston City.....	103	95	92.2	8	7.8
Boston Dispensary.....	24	18	75.0	6	25.0
Massachusetts General.....	188	148	78.7	40	21.3
Massachusetts Memorial.....	138	127	92.0	11	8.0
Peter Bent Brinham.....	26	17	65.4	9	34.6
All other.....	42	26	61.9	16	38.1
State hospitals.....	13	11	84.6	2	15.4
Private physician.....	155	97	63.0	58	37.0



**Figure 5. Highest dilution Hinton positive tests among 155 biologic false positive reactors, Massachusetts, 1954-59**



### Summary

The division of venereal diseases of the Massachusetts Department of Public Health made a study of 703 patients who had persistently positive blood Hinton tests and who had no historical, physical, or epidemiological evidence of syphilis, on the basis of protocols submitted by their physicians. Each of these patients represented a diagnostic problem to the private or clinic physician, and a treponemal test was indicated.

When the *Treponemal pallidum* immobilization (TPI) and the Reiter protein complement fixation (RPCF) tests were positive, the diagnosis of syphilis could be confirmed. When an RPCF test was negative, the physician was advised to have his patient have a TPI test. If both tests were negative, the patient could be classified as a biologic false positive (BFP) reactor, with a few reservations. The sensitivities of the TPI and the RPCF tests were compared with the sensitivity of the Hinton tests in the various stages of untreated syphilis.

On the basis of all available data, including the treponemal tests, 548, or 78 percent, of the 703 diagnostic problem patients were found to be infected, and 155 (22 percent) were BFP reactors. Approximately 70 percent of the white and 96 percent of the nonwhite patients had syphilis. The infection rate was about 82 percent in clinic patients and 63 percent in private patients. More cases of syphilis were discovered in both men and women who were

married or who had been married than in single persons.

In these diagnostic problem cases, with the exception of white patients aged 15 to 19 years, the number of cases of syphilis discovered increased up to age 45, when the infection rate tended to level off. Of practical interest was the sharp increase in BFP reactions in white patients in the age group 15-19 years.

More syphilis was found in the larger cities, and the highest rate was in Boston, the largest city in the study area. Areas in Boston and elsewhere in the State which have a higher syphilis prevalence also showed a higher infection rate among these diagnostic problem cases. This was reflected in the number of syphilis cases in the hospitals drawing their patients from these areas.

When the 155 patients with BFP reactions were studied to correlate their highest dilution serologic titers with their diagnoses, it was found that only one had a positive dilution titer of 1:16; all others had lower positive titers. This coincides with the experience of physicians that, generally speaking, patients with BFP reactions have low-titer serologic titers. Many exceptions can be found, however.

Results of this study indicate strongly that the reagin tests are still valuable in the diagnosis of syphilis. Even when diagnostic problems arise, almost 80 percent of patients with a persistently positive blood reagin test have or have had syphilis. For this reason, such patients must be considered to be syphilitic until proved otherwise. Today, a diagnosis of BFP should not be made in Massachusetts without the benefit of the RPCF test as a screening device, and if this test is negative, the TPI test should be performed. Only when both treponemal tests are negative can the diagnosis of biologic false positive reaction be entertained in a patient with a persistently positive reagin blood test.

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## Training Courses

**Mobilization.** Four courses to train medical and health personnel in emergency civil defense services are scheduled for fiscal year 1961 by the Public Health Service and the Office of Civil and Defense Mobilization. Three of them, offered for the first time, are for hospital administrators, registered nurses, and environmental health personnel. The fourth repeats basic health mobilization training for physicians and health-related professions given in the spring of 1960. All courses cover basic civil defense concepts, current information on biological, chemical, and radiological warfare, and community disaster planning. Tuition and housing are without cost to students and about half of necessary travel expenses are reimbursable through OCDM student training funds. Enrollments are limited. Apply through State civil defense directors. The courses are:

*Health Mobilization Program for Emergency Hospital Management.* OCDM Eastern Instructor Training Center, Brooklyn, N.Y., December 4-9, 1960. (Professional endorsement of the American Hospital Association.)

*Nursing Aspects of Health Mobilization.* OCDM Staff College, Battle Creek, Mich., April 23-28, 1961.

*Environmental Health Aspects of Health Mobilization.* Battle Creek, Mich., April 23-28, 1961.

*Health Services Aspects of Health Mobilization.* OCDM Eastern Instructor Training Center, Brooklyn, N.Y., May 7-12, 1961.

**Sanitary Engineering.** Training courses scheduled by the Robert A. Taft Sanitary Engineering Center include a course on medical and biological aspects of air pollution for physicians, veterinarians, and control officials dealing with health-related hazards, and another on determining antibiotic and pesticide residues in milk for professional people in regulatory and control agencies and in industry.

*Medical and Biological Aspects of Air Pollution.* Primarily treats health aspects of air pollution as observed in recorded incidents and explored through laboratory and epidemiological investigations. Also outlines concepts of an engineering program for supplementing assessment of a community's air pollution problem. December 12-16, 1960.

*Determination of Antibiotic and Pesticide Residues in Milk.* Detection techniques and procedures, including sessions for exchange of problems encountered by responsible officials. December 12-16, 1960.

Direct requests for more information and applications to the Chief, Training Program, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio, or to a Public Health Service regional office director.

# Screening for Diabetes With the Clinitron

HENRY PACKER, M.D., Dr.P.H., R. F. ACKERMAN, M.D., and JEAN M. HAWKES, M.D.

**D**URING THE PERIOD October 1, 1956, to May 15, 1959, the Hewson clinitron was employed in a diabetes detection program which tested 7,294 persons coming to the outpatient department of the City of Memphis Hospitals for health card examinations. Most of these persons were referred by employment agencies, public welfare agencies, and employers. Testing for diabetes was performed as part of a multiple screening program which also included tests for syphilis, tuberculosis, uterine cancer, and glaucoma. Urine as well as blood was examined in the preliminary screening tests for diabetes in order that the relative sensitivity and specificity of both test methods could be compared in a separate report.

The present report is concerned only with a comparison of results obtained with use of the clinitron for screening at the preselected levels of 180 mg. percent, 160 mg. percent, and 130 mg. percent, using fingertip blood. Information concerning the Wilkerson-Heftmann method of blood sugar determination (1) and the operation of the clinitron (2) can be found in the literature and will not be detailed here. Suffice it to say that this instrument can complete as many as 120 tests per hour when it is operated at capacity, indicating, in less than 6

minutes per individual test, whether a specimen contains enough true glucose to exceed the preselected screening level. The solution in which the blood and reagent tablets are placed turns blue when the test is negative and becomes colorless when it is positive. Reagent tablets required for the clinitron are available commercially, and the cost of the four tablets required for each test is approximately 5 cents.

The clinitron is an expensive piece of equipment which lends itself mainly to mass testing programs. For testing on a smaller scale, using the same tablets and technique, a less expensive instrument (the Glover-Edwards Glucose Test Kit) is available. The present study was undertaken to evaluate the relative yield of true and false positives at the three testing levels which can be used with the clinitron. An evaluation of the instrument for small-scale testing is now in progress.

## Procedure

Fingertip blood was drawn from all persons applying for a health card. The amount drawn was either 0.1 or 0.1125 ml., depending on the testing level employed at the time of the examination. Persons showing a positive test were called back for retesting with a modified glucose tolerance test in which two blood sugar determinations, one fasting and the other 2 hours after the administration of 100 grams of glucose, were obtained. Persons showing over 140 mg. (Folin-Wu method) on the 2-hour blood sugar were referred to the City of Memphis Hospitals' medicine clinic for definitive evaluation for diabetes, unless they were ineligible for evaluation by the clinic. The few who were ineligible were referred to private physicians.

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*The authors are with the University of Tennessee College of Medicine in Memphis. Dr. Packer is professor, and Dr. Ackerman is assistant professor, in the division of preventive medicine. Dr. Hawkes is associate professor in the division of medicine. Robert M. Thorner of the Chronic Disease Branch, Bureau of State Services, Public Health Service, and Miss Nina V. Fisher of the Service's Atlanta Regional Office assisted in the analysis of statistical data. Research was supported in part by funds from the Chronic Disease Branch.*



For the purposes of this comparison, all persons positive to the retest procedure, that is, showing over 140 mg. on the 2-hour blood sugar determination, were arbitrarily designated as diabetics. In almost all cases, these designations were confirmed by further evaluation. Persons who were positive on the screening test but negative on the retest were designated as false positives in this study.

The three testing levels were not employed concurrently, but consecutively. The 180 mg. level was used between October 1956 and March 1957; the 160 mg. level, between April 1957 and December 1957; and the 130 mg. level, between January 1958 and May 1959. The specific periods are indicated because from time to time we have suspected that the season of the year influenced screening results, although we do not have confirmatory evidence of this.

#### Characteristics of Study Group

The yield of a detection program is influenced greatly by the characteristics of the population group under study and the extent of unrecognized diabetes. Table 1 indicates the distribution of persons tested, by age, sex, and color. Women constituted approximately four-fifths of the total group, and approximately two-thirds of the total were nonwhite women. Approximately 70 percent of the total group were between the ages of 30 and 50 years, and more than 90 percent were between 30 and 60 years of age. Although the age, race, and sex dis-

**Table 1. Distribution of persons tested for diabetes, by age, sex, and color, City of Memphis Hospitals, 1956-59**

Age group (years)	Total	White		Nonwhite	
		Male	Female	Male	Female
Total.....	7, 294	500	1, 293	703	4, 798
Under 30.....	47	3	13	5	26
30-39.....	2, 778	183	482	231	1, 882
40-49.....	2, 358	163	411	190	1, 594
50-59.....	1, 489	107	268	138	976
60-69.....	452	35	91	84	242
70-79.....	131	8	25	40	58
80 and over....	29	1	0	12	16
Unknown.....	10	0	3	3	4

**Table 2. Time of diabetes test in relation to last meal, City of Memphis Hospitals, 1956-59**

Time since eating (hours)	Persons tested	Percent of total
Total.....	7, 294	100. 0
Less than 1.....	775	10. 6
1 to 2.....	1, 518	20. 8
2 to 3.....	1, 663	22. 8
3 or more or fasting.....	3, 325	45. 6
Unknown.....	13	. 2

tribution of populations tested at each of the three screening levels was generally similar, the proportion of nonwhite women under 40 years of age was higher in the group screened at 180 mg. than in the groups screened at either 130 mg. or 160 mg. This relatively large group of young nonwhite women probably has exerted a small downward influence on the yield of new diabetes cases at the 180 mg. testing level.

Table 2 indicates the time of testing in relation to the last food intake. Since persons applied for tests throughout the day, no control could be exerted over the time interval between testing and the last food eaten. No attempt was made to adjust the screening level in relation to the time of last food intake. Thus this study provided an opportunity for comparing the yields of new diabetes cases from testing done at random intervals after eating when a single testing level was employed. The high proportion of our study group (45.6 percent) tested while in a fasting state should be noted, since fasting blood specimens are generally considered undesirable for such testing (2), and our yield of new cases has undoubtedly been influenced by this factor. However, because the distribution of persons tested by time since eating was essentially the same at each screening level, this factor did not affect the comparability of results at the three levels.

#### Analysis of Results

New diabetes cases found as the result of all tests performed during the study period are shown, by age group, in table 3. Of all persons tested (7,294), 1.6 percent were found to have

**Table 3. Yield of new diabetes cases, by age, City of Memphis Hospitals, 1956-59**

Age group (years)	Persons tested	New diabetes cases	
		Number	Percent of total
Total	7, 294	115	1. 6
Under 30	47	0	0
30-39	2, 778	16	0. 6
40-49	2, 358	32	1. 4
50-59	1, 489	38	2. 6
60-69	452	24	5. 3
70 and over	131	5	3. 8

previously unrecognized diabetes. The percentage of new cases increased with increasing age up to 70 years, and ranged from 0.6 in the 30- to 39-year group to 5.3 in the 60- to 69-year group.

To examine the relative prevalence in the different race and sex groups, age-specific rates were calculated, based on the total known and new diabetics and adjusted to the age distribution of all persons tested. The age-adjusted rates are as follows:

Race and sex	Rate per 100
All	4. 3
White male	2. 7
White female	2. 2
Nonwhite male	3. 1
Nonwhite female	5. 3

While these rates are based on small numbers in several age brackets, they follow the same pattern of higher diabetes mortality rates shown

in national statistics for nonwhites compared with whites. The higher rate indicated above for nonwhite women than for nonwhite men also bears out the male-female relationship in national mortality data. This relationship does not hold for whites in our survey; however, only 500 white men were tested.

Table 4 shows the influence of the time interval between testing and the last food intake on new diabetes cases found and on false positive results. Tests performed on persons in a fasting state showed the lowest yield (1.1 percent) of new cases, whereas the highest yield (2.7 percent) was observed in tests performed between 1 and 2 hours after eating. Of total persons screening positive, those tested between 1 and 2 hours after eating also produced the lowest percentage (28.1) of false positives. The highest percentage (53.3) of positive screening results subsequently identified as false positive occurred in tests performed within 1 hour after eating. The same patterns of yield and false positives in relation to these intervals between food intake and testing were observed in the results obtained at all three screening levels.

One of the main objectives of this study was to compare the relative yields of true and false positives at the three screening levels employed with the clinitron. Our results are summarized in table 5. Screening at the 130 mg. level yielded a higher return (2.4 percent new cases) than when screening was done at the 160 mg. level (1.1 percent new cases) or at the 180 mg. level (0.5 percent new cases). The difference between the results of screening at 160 and 180

**Table 4. Time of test after eating in relation to yield of new diabetes cases and false positives, City of Memphis Hospitals, 1956-59**

Time since eating (hours)	Persons tested	New diabetes cases		False positives		
		Number	Percent of total tested	Number	Percent of total tested	Percent of total screening positive
Less than 1	775	14	1. 8	16	2. 1	53. 3
1 to 2	1, 518	41	2. 7	16	1. 0	28. 1
2 to 3	1, 663	23	1. 7	19	1. 1	45. 2
3 or more or fasting	3, 325	37	1. 1	21	. 6	36. 2
Unknown	13	0	0	0	0	0

**Table 5. Screening level in relation to new diabetes cases and false positives, City of Memphis Hospitals, 1956-59**

Screening level (mg./100 ml.)	Persons tested	New diabetes cases		False positives		
		Number	Per- cent of total tested	Number	Per- cent of total tested	Per- cent of total screen- ing posi- tive
130-----	3, 315	81	2. 4	66	2. 0	38. 4
160-----	2, 483	26	1. 1	4	0. 2	13. 3
180-----	1, 496	8	0. 5	2	0. 1	16. 7

mg. was not statistically significant, but the yield of new cases using the 130 mg. level was significantly greater ( $P=.05$ ) than when the higher screening levels were employed.

Table 5 also indicates the false positive results occurring at each of the testing levels in relation to all persons tested and to all persons screening positive. The retest load at each screening level is thereby delineated. Thus, when the 130 mg. level was used, it was necessary to identify as nondiabetic by retest 2 persons out of every 100 originally screened in order to obtain the yield of 2.4 percent new diabetics. Expressed the other way, approximately 38 persons out of each 100 who screened positive at this level and were therefore retested were found to be nondiabetic. At the other extreme, when the 180 mg. level was employed, only about 1 person per 1,000 screened was falsely reported as positive, and only 17 persons out of each 100 screening positive turned out to be nondiabetic. However, the yield of new cases of diabetes was low at 180 mg., being approximately one-fifth as great (0.5 percent) as that observed when the 130 mg. level was used (2.4 percent).

### Discussion

In conducting a diabetes screening program, primary consideration must be given to factors which increase the yield of previously unrecognized cases and also to factors which increase the need for retesting in order to identify prop-

erly those persons who screen positive but do not have diabetes. Although optimum performance, in terms of maximizing the former and minimizing the latter, is a desirable objective, administrative considerations may occasionally necessitate a compromise which falls short of achieving such optimum results. For example, in one situation an unlimited load of retesting can be undertaken, thereby making it possible to achieve a high yield of new cases discovered. Testing with the clinitron at the 130 mg. level would be appropriate under these conditions. In the light of our findings and in view of our circumstances, we shall employ this level of testing in our health card program in the future. Others (3,4) have also found that this level produces optimum casefinding results.

Under different circumstances, the volume of retesting required by use of the 130 mg. level with the clinitron may be unacceptable. For example, we have encountered the resentment of some patients who were screened in other programs and who incurred considerable expense when they were referred to private physicians because of what turned out to be false positive screening tests. Physicians as well as patients tend to lose confidence in a detection program which necessitates reassuring many persons through further study that diabetes is not present in spite of a positive screening test. We have been able to obviate this factor to some extent by performing modified glucose tolerance tests on persons screening positive before referring them to private physicians. To minimize this factor in some programs, it may be necessary to use a higher screening level, such as 160 mg. or 180 mg., even at a sacrifice of yield.

Some of the factors affecting the performance of a diabetes screening program may be beyond administrative control. The total prevalence of diabetes, the prevalence of the component of unrecognized diabetes, and the age, color, and sex distribution of the population studied are factors of this nature. Factors which lend themselves to administrative control are selection of age groups for testing and selection of testing levels when the clinitron is used. Selection of the time interval between eating and testing may or may not be subject to control.



We have not been able to control this factor in our program.

It should also be recognized that fingertip blood is capillary blood which is practically arterial blood. Arterial blood shows much higher sugar readings after food than venous blood. Screening results employing fingertip blood would therefore be expected to be more sensitive at 1 and 2 hours after eating. In the fasting state venous and capillary blood have similar amounts of sugar, and the differences in sensitivity between fasting and 3-hour specimens would be negligible. These factors should be taken into consideration when venous blood is employed with the clinitron instead of fingertip blood as in our study.

### Summary

Seven thousand two hundred and ninety-four persons applying for health cards were screened for diabetes, using testing levels of 130 mg., 160 mg., and 180 mg. with the clinitron, during consecutive periods of time. Retests with a modified glucose tolerance test were performed on all persons screening positive.

The percentage of persons tested who were found to have previously unrecognized diabetes ranged from 0.6 in the 30- to 39-year age group to 5.3 in the 60- to 69-year group. Age-adjusted rates based on the total number of known and new diabetics revealed higher rates in non-whites than in whites, with nonwhite women showing the highest rate of any group (5.3 percent).

The highest yield of new diabetes cases (2.7 percent) was observed when testing was done between 1 and 2 hours after eating. Tests performed during this interval after eating also produced the lowest percentage of false positives in relation to total positive screening results.

The percentage of new cases found when the 130 mg. level was employed (2.4) was significantly higher than when higher screening levels were used. However, a significantly higher retesting load was encountered with use of the 130 mg. level than when the other levels were employed.

Selection of the appropriate screening level for use with the clinitron in a diabetes detection program hinges, in each case, on individual circumstances, of which the feasibility of retesting is an important example.

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### Correction

In the Statement on Oral Poliovirus Vaccine in the October issue of *Public Health Reports*, p. 871, last column, last two lines, the name of the chairman of the Public Health Service Committee on Live Poliovirus Vaccine should be Roderick Murray, M.D.

# 1959 Summary of Disease Outbreaks

CARL C. DAUER, M.D., and DONALD J. DAVIDS

THE NUMBER of reported outbreaks of waterborne and foodborne diseases was slightly higher in 1959 than in 1958 (table 1). There was a considerable increase in number of reported outbreaks and cases of staphylococcal food poisoning as compared with the previous year, but this was largely offset by smaller numbers in some other categories (table 2).

While it seems improbable that outbreaks of foodborne diseases were more completely reported in 1959 than in previous years, there is evidence that more extensive laboratory investigations were being carried out in some areas.

The number of outbreaks in which phage typing of staphylococci was done increased in 1959. In a few instances, the same phage type of organism was recovered from specimens of food as from persons who were handling or preparing foods. Phage types 7 and 47 were more commonly reported than any others. Phage type 80/81 was recovered from ham in one outbreak and from milk in another. A few reports indicated that phage typing was being done but the results of tests were not received.

Introduction of coagulase-positive strains of staphylococci of human origin into herds of dairy cattle is receiving more attention. In one State antibiotic-resistant strains of phage type 80/81 were recovered from superficial lesions on the udders of cattle in a herd owned by a carrier of this type of staphylococcus. Two other adults in the family also were carriers of this type. When the animals were moved to new premises and their human contacts

changed, their lesions disappeared. A similar situation was reported recently by Wallace (1). Phage type 80/81 was recovered from four cattle in a dairy herd and also from lesions on one worker at the dairy farm. One State is now conducting an intensive study of staphylococcal infections in cattle and their relationship to human infections and disease.

Several outbreaks of foodborne diseases were reported in 1959 in which *Clostridium perfringens* (*welchii*) was considered or suspected as the etiological agent. This spore-forming organism, of which one type (A) causes gas gangrene, has been recognized as the etiological agent in outbreaks in England for a number of years. Its association with disease outbreaks in the United States had been suspected but was not proved until recently. Failure to recognize the role of this organism in foodborne diseases in this country has been due partly to the fact that it can be recovered only when incubated anaerobically. The procedures required for identification of the organism are complicated, and few laboratories are equipped to perform them. *C. perfringens* is widely distributed in nature in feces, sewage, and soil. Outbreaks due to this bacterium are usually associated with meat, including fowl, that has been cooked and allowed to cool slowly at room temperature. The incubation period of illnesses is about 8 to 12 hours but may be as long as 22 hours. According to Dack (2), the characteristic symptoms are acute abdominal pain and diarrhea, usually of short duration.

In 1959, there were 75 outbreaks of foodborne diseases, affecting more than 1,200 persons, in which poultry or other meat was thought to be the vehicle of infection but no etiological agent was identified. Possibly some of these were caused by *C. perfringens*. It has

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been suggested that when specimens of food, especially meat dishes, are examined bacteriologically, provision should be made for culturing them anaerobically if the common pathogens associated with food poisoning or infections are not readily isolated in substantial numbers. Anaerobic culturing is especially important when abdominal pain and diarrhea are predominant symptoms following an incubation period of about 10 to 12 hours.

Another spore-forming organism, *Bacillus cereus*, was presumably associated with an outbreak in 1959 for the first time in the United States. This organism has been implicated in several outbreaks in Scandinavian countries during the past decade. Since it is widely distributed in soil, dust, milk, and on plant surfaces, it may possibly be a more frequent etiological agent in foodborne disease than is generally recognized. However, further study is required to assess its importance in such illnesses.

These experiences indicate the importance of laboratory procedures in the investigation of foodborne disease. When these procedures are combined with more complete epidemiological investigation and more complete reporting of outbreaks, the foundation will be laid for reducing appreciably the amount of these illnesses. Estimating the amount for the country as a whole on the basis of reports from one or two States that appear to have reasonably complete reporting, there would be at least 1 million cases annually instead of the present 10,000.

#### Waterborne Outbreaks

Seven reports of waterborne outbreaks were received during 1959. These consisted of three reports of typhoid fever and one each of amebiasis, hepatitis, chemical poisoning, and an outbreak in which *Escherichia coli* and enterococci were isolated from the water source.

One of the outbreaks of typhoid fever was traced to a small city's public water supply obtained from a creek, which was contaminated by a typhoid carrier who lived upstream. Slow sand filtration was the only treatment given the community's water. Prior to onset of the outbreak, the filters were being cleaned and their efficiency was reduced for a few days. A heavy rain flooded the creek, and for several days the

**Table 1. Foodborne and waterborne disease outbreaks reported in 1959, by vehicle of infection**

Area	Water		Milk and milk products		Other foods <sup>1</sup>	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Total-----	7	206	11	49	322	10, 595
New England:						
Maine-----			1	3	7	306
New Hampshire--	1	14			2	10
Vermont-----					1	40
Massachusetts--					6	342
Rhode Island----					2	30
Connecticut-----					2	46
Middle Atlantic:						
New York-----	1	4	1	3	26	1, 220
New Jersey-----					1	23
Pennsylvania----					3	61
East North Central:						
Ohio-----			1	3	14	1, 499
Indiana-----					2	1, 333
Illinois-----	1	11			14	494
Michigan-----	1	160			1	4
Wisconsin-----			1	3	3	122
West North Central:						
Minnesota-----					5	447
Iowa-----					1	68
Missouri-----					1	22
Kansas-----			1	5		
South Atlantic:						
Maryland-----					1	57
Dist. of Columbia--					2	301
Virginia-----	1	9			3	197
West Virginia-----					5	27
North Carolina----					1	36
Georgia-----			1	14	2	33
Florida-----					1	155
East South Central:						
Kentucky-----					2	27
Tennessee-----					1	261
Alabama-----					2	290
Mississippi-----	1	5			2	19
West South Central:						
Arkansas-----					1	2
Texas-----					3	525
Mountain:						
Idaho-----					2	18
Wyoming-----					1	91
Colorado-----					5	295
New Mexico-----					2	21
Arizona-----					1	35
Pacific:						
Washington-----			3	11	42	185
Oregon-----					9	115
California-----	1	3	2	7	137	1, 702
Noncontiguous:						
Alaska-----					2	7
Hawaii-----					3	113
Puerto Rico-----					1	16
United States, 1958--	4	445	13	441	236	9, 925
United States, 1957--	4	131	8	67	250	11, 085

<sup>1</sup> Includes outbreaks among military personnel.



**Table 2. Foodborne, waterborne, and other disease outbreaks reported in 1959, by type of infection**

Area	Typhoid fever		Salmonellosis		Shigellosis		Trichinosis		Botulism		Staphylococcal food poisoning <sup>1</sup>		Gastroenteritis, etiology unknown <sup>1</sup>		Toxic agents		Other	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Total.....	5	43	19	1,428	6	228	6	38	10	24	89	4,138	182	4,285	14	74	9	592
New England:																		
Maine.....			3	11							2	6	3	292				
New Hampshire.....	1	14									2	10						
Vermont.....													1	40				
Massachusetts.....											2	143	4	199				
Rhode Island.....											1	17	1	13				
Connecticut.....							1	7					1	39				
Middle Atlantic:																		
New York.....	1	4					2	17			7	434	16	734	1	2	<sup>2</sup> 1	36
New Jersey.....															1	23		
Pennsylvania.....					1	21	1	4			1	36						
East North Central:																		
Ohio.....			1	374							6	943	6	166	1	16	<sup>3</sup> 1	3
Indiana.....											2	1,333						
Illinois.....			2	57							3	22	10	426			<sup>4</sup> 1	160
Michigan.....									1	4								
Wisconsin.....											4	125						
West North Central:																		
Minnesota.....											4	22	1	425				
Iowa.....											1	68						
Missouri.....					1	22											<sup>5</sup> 1	5
Kansas.....																		
South Atlantic:																		
Maryland.....											1	57						
District of Columbia.....													1	103			<sup>3</sup> 1	198
Virginia.....	1	9			1	100					1	72	1	25				
West Virginia.....											3	14	2	13				
North Carolina.....											1	36						
Georgia.....			1	14	1	30											<sup>3</sup> 1	3
Florida.....													1	155				
East South Central:																		
Kentucky.....											2	27						
Tennessee.....													1	261				
Alabama.....											1	134	1	156				
Mississippi.....											1	16	1	3			<sup>6</sup> 1	5
West South Central:							1	2										
Arkansas.....																		
Texas.....			1	400							1	85	1	40				
Mountain:																		
Idaho.....									1	6			1	12				
Wyoming.....											1	91						
Colorado.....			1	130					2	2	1	2					<sup>7</sup> 1	161
New Mexico.....	1	12									1	9						
Arizona.....			1	35														
Pacific:																		
Washington.....	1	4							1	2	1	4	42	186				
Oregon.....					1	7					4	37	2	64	2	7		
California.....			8	322	1	48			3	3	33	359	85	933	9	26	<sup>3</sup> 1	21
Noncontiguous:																		
Alaska.....									2	7								
Hawaii.....			1	85			1	8			1	20						
Puerto Rico.....											1	16						
United States, 1958.....	1	30	27	1,043	3	392	7	68	3	4	62	2,291	134	6,216	14	169		
United States, 1957.....	4	70	30	1,607	11	754	1	14	6	12	58	1,660	135	6,065	8	68		

<sup>1</sup> Includes outbreaks among military personnel. infections. <sup>4</sup> Infectious hepatitis. <sup>5</sup> Brucellosis.

<sup>2</sup> Streptococcal infections. <sup>6</sup> Amebiasis.

<sup>3</sup> *Clostridium perfringens* <sup>7</sup> *Bacillus cereus* infections.

number of *E. coli* organisms from water samples was much higher than usual. Since the carrier's campsite had no privy, fecal material probably was carried to the creek during the rainstorm. The city has recently installed a chlorinator and has introduced certain protective measures on the watershed.

A few cases of chemical poisoning resulted from copper carbonate which had formed in the copper tubing in a water fountain. A communitywide outbreak of hepatitis was thought to be due to contamination of wells by spring runoff water. In the other outbreaks private wells or springs were the sources of water.

### Milkborne Outbreaks

Eight of the eleven outbreaks considered to be milkborne were traced to contaminated milk products rather than to milk itself. A few cases of brucellosis found during a countywide survey for brucellosis in a midwestern State were attributed to raw milk from a dairy, but other cases in this county were not specifically linked to the dairy. Several cows in the dairy herd gave positive reactions to *Brucella* antigen. Two outbreaks of staphylococcal food poisoning were attributed to raw milk in private homes. Of the 11 outbreaks, 6 were confirmed as staphylococcal, 1 was brucellosis, and 1 was *Salmonella typhimurium* infection following ingestion of homemade ice cream. The etiologic agent for three was not determined.

An outbreak of some 200 cases of gastroenteritis occurring simultaneously in three schools was first thought to be due to a milkborne agent since milk was the only food used in common. However, investigation revealed that perhaps the infection was spread by person-to-person contact. This outbreak is included in the category "gastroenteritis, etiology unknown," in tables 2 and 3.

### Typhoid Fever

Water was considered the vehicle of infection in three of the five outbreaks of typhoid fever reported during 1959. The sources of water were a well at a resort, a well used by migrant laborers, and a public water supply (described under waterborne outbreaks). The outbreak at the resort involved four persons who visited the cabin of a woman later found to be a chronic

carrier or who rented or visited the cabin after she left. Typhoid bacilli, type E1, were isolated from the patients and from the well. The sewage from the cabin was discharged into a cesspool.

During the investigation of an outbreak following a wedding reception, *Salmonella typhosa*, type E1, was isolated from one of the women foodhandlers as well as from some of the patients. The foodhandler had not been ill. The suspect food was ham sandwiches. The other outbreak occurred among members of a family traveling by automobile part way across the country. The source of infection was not determined.

### Salmonellosis

Although outbreaks of salmonellosis reported in 1959 were fewer than in 1958, they resulted in more cases. During 1959, as in 1958, poultry and other meats were the most common foods involved. They were the vehicle in 10 of the 19 outbreaks. The most common sources of food were social gatherings and private homes, although the largest number of cases resulted from outbreaks in institutions. Eight species of *Salmonella* were recovered from patients or from food. These were: *S. typhimurium* in 7 instances, *S. blockley* in 3 instances, *S. bredeney* and *S. oranienburg* in 2 instances each, and *S. taksony*, *S. saint-paul*, *S. newington*, and *S. heidelberg* in one each. One report identified the organisms only as group C. In one of the outbreaks only a few clinical cases were reported, but on the basis of laboratory study of stool specimens it was estimated that the infection rate was as high as 50 percent of the 1,000 persons exposed. In this outbreak, *S. newington* was found in frozen eggs produced in another State. It was thought that a foodhandler became infected from the eggs and contaminated the meat. *S. newington* was recovered from the meat and from the block on which the meat was cut. In a laboratory study of an outbreak on an institutional farm in another State, *S. typhimurium* of the same phage type was isolated from inmates and three hogs.

### Shigellosis

In none of the six reported outbreaks of shigellosis was a particular vehicle identified,

although food was suspected in two. Two of the outbreaks occurred among school children; one was a community outbreak thought to be due to poor sanitation, and the other three occurred in a youth guidance group, in a day nursery, and among children attending a school party. *Shigella sonnei* was recovered from patients in five of the outbreaks. The organism isolated from children attending the school party was *Shigella flexneri*.

Another report, not included in our tabulations, stated that an unusual number of *S. sonnei* infections occurred during the last half of 1959 in an eastern city. Cases were distributed equally among white and nonwhite persons living in a low socioeconomic area. The majority of the nonwhite patients were children under 10 years of age, whereas the white patients were older. Many possible chains of transmission were noted.

### Trichinosis

The meats involved in the six outbreaks of trichinosis were raw pork, raw ground lamb, cooked pork, a spiced bacon roll resembling salami, rare hamburger, and smoked sausage. In the last outbreak, various types of pork were eaten, but the smoked sausage was considered the most likely source of infection. The ground lamb and hamburger were purchased from commercial establishments. It was thought they were contaminated from pork residue in the meat grinders. Although the commercially prepared bacon roll was labeled to be cooked, it was eaten raw. The other pork products were home processed.

### Botulism

Epidemiological reports were received of 24 cases of botulism occurring in 10 outbreaks. In two of the outbreaks six cases were reported.

**Table 3. Outbreaks of certain foodborne diseases reported in 1959, by type and source of food**

Food	Salmonellosis		Shigellosis		Staphylococcal food poisoning		<i>Clostridium perfringens</i> infections		Gastroenteritis, etiology unknown	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Type of food										
Poultry	5	109			7	1,050	2	201	23	887
Other meat	5	895			31	1,912	2	24	52	395
Fish									9	86
Custard-filled dessert					19	131			10	163
Salad	1	32			15	613			14	539
Other	3	109			16	420			27	208
Not determined	5	283	2	37	1	12			46	1,996
Total	19	1,428	2	37	89	4,138	4	225	181	4,274
Source of food										
Public eating establishments	2	99			14	214	1	3	72	724
Private clubs	1	130			2	194			9	160
Schools	1	35	2	37	5	419			10	776
Colleges					2	83			1	425
Hospitals and institutions	3	777			7	1,104			11	641
Labor camps					1	66			3	138
Social gatherings	6	310			8	255	1	21	14	456
Private homes	5	40			32	163			47	181
Transportation	1	37			5	45	1	198	2	51
Picnics					4	1,496				
Other					8	97			8	591
Not stated					1	2	1	3	4	131
Total	19	1,428	2	37	89	4,138	4	225	181	4,274



Seven of the twenty-four cases resulted in death. Beans were implicated in three outbreaks, beets in three, and mushrooms, whale flipper, fish eggs, and corn in one each. All the food was home processed. The corn, which had been discarded because it looked and smelled bad, was added to a mash for chickens. A child ate the mixture and became ill. Before the child was stricken, however, some 30 chickens that ate the mash had died. *Clostridium botulinum*, type A, was recovered from the suspect food in two outbreaks and type E in one. The type was not reported for another outbreak, and in the remaining outbreaks the particular food was not available for analysis.

### Staphylococcal Food Poisoning

About one-third of the 89 outbreaks of staphylococcal food poisoning reported during 1959 were attributed to meats other than poultry, most often ham. Custard-filled pastries were linked to 19 outbreaks. Most of the outbreaks occurred following meals in private homes, but most of the cases resulted from outbreaks among picnickers and in institutions. In some of the outbreaks occurring in private homes, the food was obtained from sources outside the home, especially the custard-filled desserts, which were often purchased from bakeries and consumed in the home. All but one of the staphylococcal food poisoning attacks listed in the transportation category occurred in airplanes. The State in which the plane landed was listed as the location of the outbreak.

### Gastroenteritis

The total of 182 outbreaks of gastroenteritis of undetermined etiology includes several outbreaks of only a few cases or of single cases which might possibly not have been due to the ingestion of food or water, but contaminated food or water (usually food) was considered the most likely cause. All outbreaks for which there was no laboratory evidence of a particular agent, either in the suspect food or water or from patients, are included in this group. The most frequent sources of food were public eating establishments (40 percent) and private homes (26 percent). Meats other than poultry were the foods most often involved or considered suspect. In many instances, no suspect food

was reported. Shellfish eaten in a restaurant was considered the food vehicle in one small outbreak. Investigation revealed that the shellfish, obtained from an authorized source, was probably leftover from a previous meal.

### Chemical Poisoning and Noxious Foods

A variety of agents were involved in incidents of chemical and noxious food poisoning. Two outbreaks were traced to meat additives, four to metals from beverage containers, two to foods inadvertently contaminated with chemicals, one to fish, three to mushrooms, and two to leaves of tree tobacco plants and night shade plants. One outbreak due to nitrites used in preserving fish occurred among persons living in two States. Fish from the same source was eaten in both restaurants and private homes. Three deaths were reported, but not all were attributed directly to the nitrite poisoning itself.

### *Clostridium perfringens* Infections

In 1959, for the first time in the United States, epidemiological reports were received of outbreaks in which *Clostridium perfringens* was determined to be the etiological agent. The first of four outbreaks occurred among passengers of an interstate train. One occurred at a family reunion and another in a restaurant. In one report, the place was not stated. *C. perfringens* was recovered from turkey in two of the outbreaks, from roast beef in one, and from salami in the other.

### Other Disease Outbreaks

One outbreak of streptococcal infection, at a college, was reported. Streptococci were isolated from a tuna-macaroni-mushroom dish. An outbreak in another State was found to be due to *Bacillus cereus*. The organisms were found in stool specimens from some of the patients and in samples of turkey.

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# Final Report of Poliomyelitis Epidemic in Detroit and Wayne County, 1958

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**E**PIDEMIC poliomyelitis presents serious public health problems both during the acute phase and in the extended convalescent and recovery periods. During the 1958 epidemic in Detroit, the Detroit Health Department effectively mobilized its personnel and facilities to face these problems and has since used the experience gained to prevent their recurrence. A preliminary report of this epidemic was published in 1959 (1). This paper presents the final report of the 1958 poliomyelitis experience in Detroit and Wayne County.

The toll of the 1958 poliomyelitis outbreak was similar to that of prevaccine days: 874 cases of poliomyelitis, 462 nonparalytic and 412 paralytic, were reported in a population of 2,842,000 (fig. 1, table 1). There were 25 deaths (table 2); 177 cases were initially diagnosed as paralytic but on followup were found to have neither residual paralysis nor minor sequelae of poliomyelitis. Those significantly or severely disabled numbered 224; information was not available on 11. Table 3 shows the distribution of residual paralysis.

Few cases were reported prior to mid-July.

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*Data on poliomyelitis patients hospitalized at Herman Kiefer Hospital during the 1958 poliomyelitis epidemic were obtained from Dr. Donald C. Young, director of the communicable disease service. Virus studies were performed by Dr. Gordon C. Brown at the virus laboratory, University of Michigan School of Public Health, Ann Arbor.*

Then the number rose sharply, reaching a peak in mid-September (fig. 2). Cases continued to be reported throughout October, and sporadic cases persisted into November. The central area of Detroit was hardest hit; 91.6 percent of all paralytic cases in the city occurred in that area. Outside Detroit poliomyelitis has usually reached its peak in mid-August.

This was the 13th year of high poliomyelitis incidence for Detroit, and almost its worst—exceeded only by the 1952 incidence, when 748 cases were reported with 41 deaths (table 4). Wayne County had 344 cases in 1952, of which 152 were paralytic; in 1958 there were 225 cases, 66 of them paralytic.

The occurrence of poliomyelitis in epidemic proportions in the nonwhite population of Detroit in 1958 followed the trend of Chicago's experience in 1956 (2). Of the 346 paralytic cases in Detroit, 271 occurred in the nonwhite population (table 1). The specific rate for the nonwhite population was estimated at 37 per 100,000 compared with 5.2 per 100,000 for the white population. Thus, the rate for nonwhites appears to have been more than 10 times the rate for whites. This apparent increase in the proportion of paralytic cases among nonwhites has appeared since the advent of a preventive vaccine.

The incidence of nonparalytic cases was highest in the group aged 5-9 years. Males accounted for 56.1 percent of all cases (table 5). Poliomyelitis was diagnosed in 14 pregnant women. Four of these cases were paralytic. There were no fatalities among them.

In 60 families more than one person was diagnosed as having poliomyelitis in 1958; 44 of these cases were paralytic; none were fatal.

Figure 1. Nonparalytic and paralytic cases of

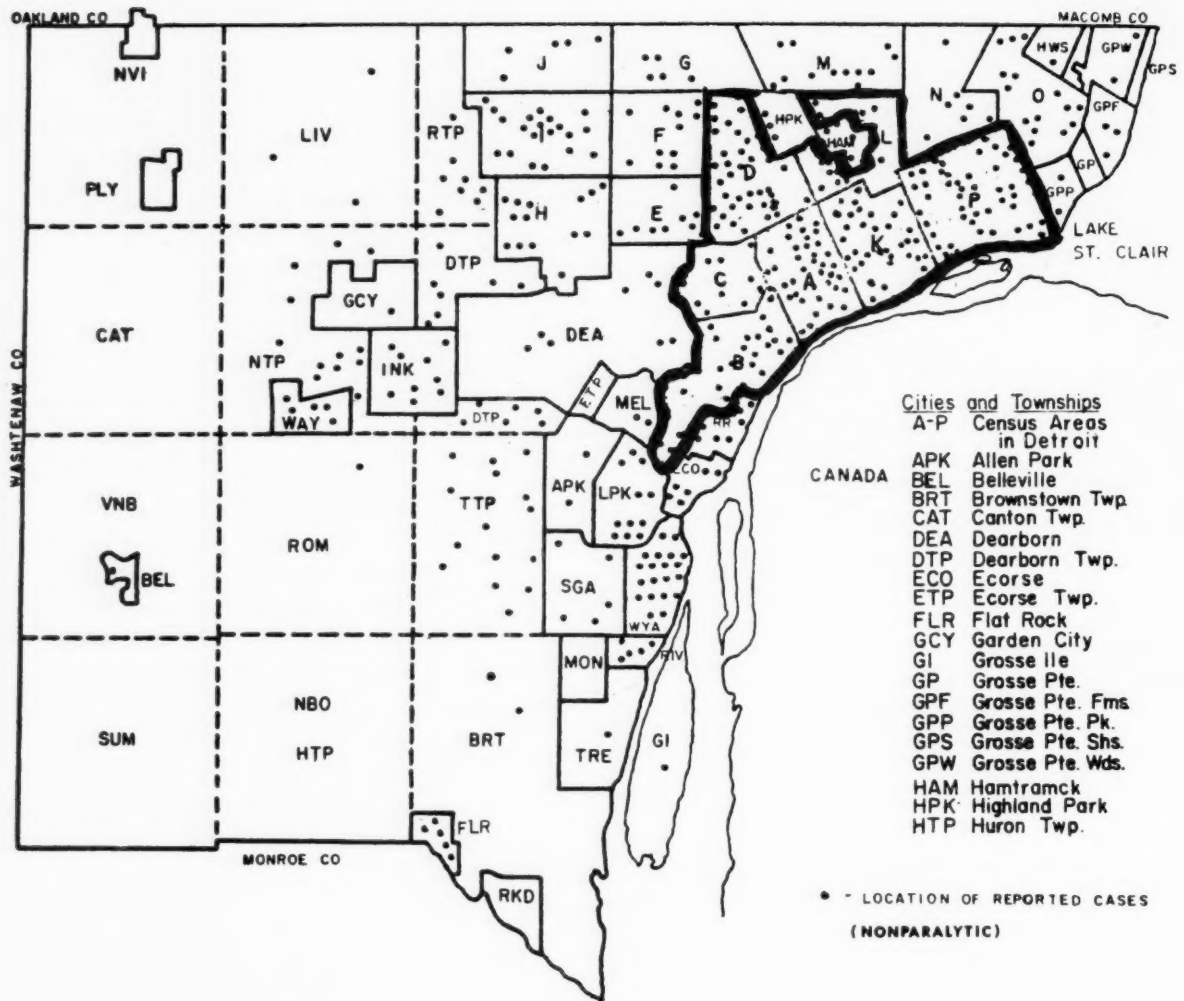


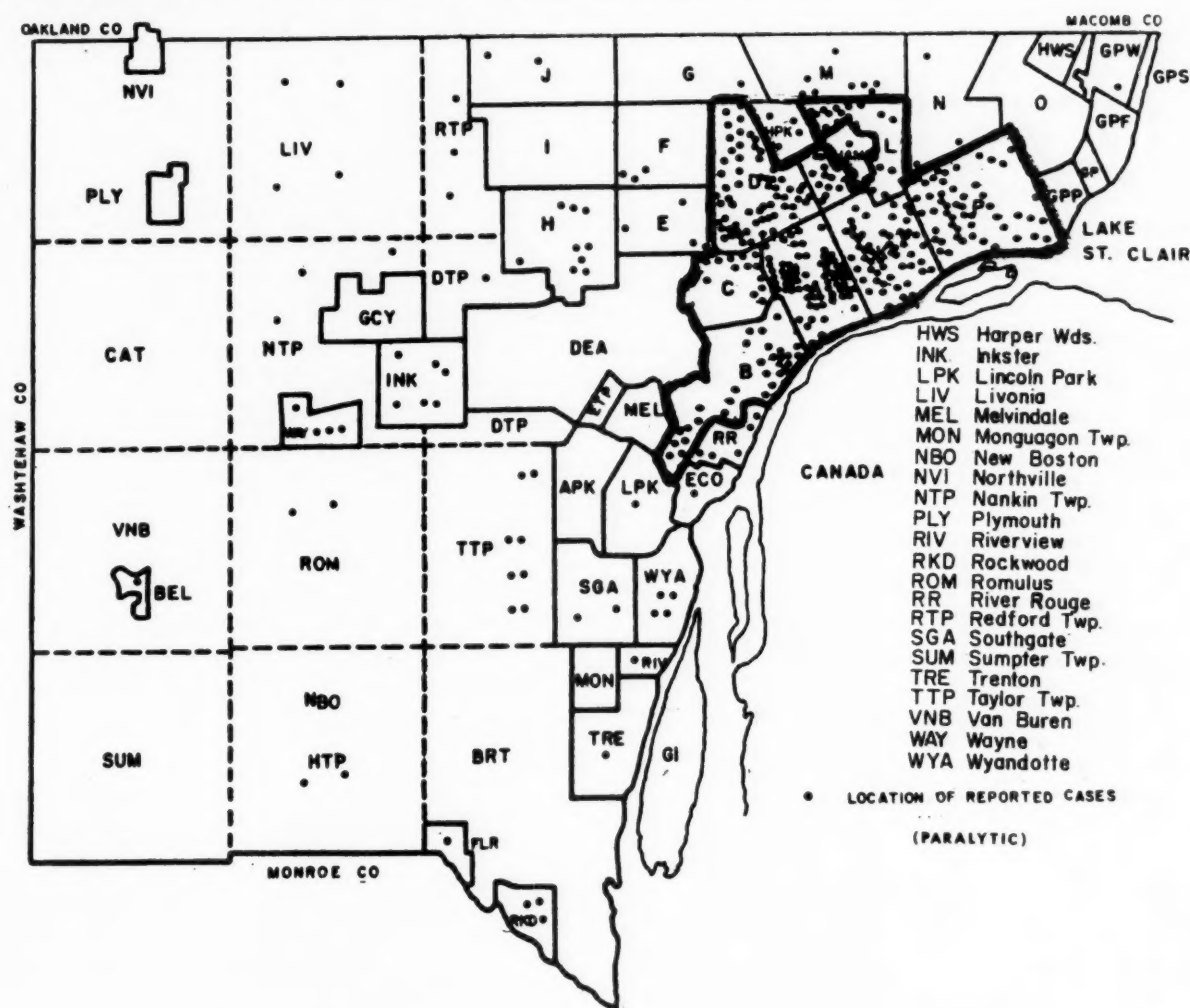
Table 1. Estimated population and number of reported paralytic and nonparalytic poliomyelitis cases in Detroit and Wayne County, Mich., 1958

Area	Estimated population			Poliomyelitis cases						
				Total re-reported	Paralytic			Nonparalytic		
	Total	White	Non-white		Total	White	Non-white	Total	White	Non-white
Wayne County	2,842,000	( <sup>1</sup> )	( <sup>1</sup> )	874	412	128	284	462	319	143
Detroit	1,900,000	1,420,000	480,000	649	346	75	271	303	173	130
Central area	1,094,000	645,000	449,000	521	317	57	260	204	81	123
Outer area	806,000	775,000	31,000	128	29	18	11	99	92	7
Remainder of county	942,000	( <sup>1</sup> )	( <sup>1</sup> )	225	66	53	13	159	146	13

<sup>1</sup> Estimate not available.



# poliomyelitis reported in Detroit and Wayne County, Mich., 1958



In 1958, children under the age of 5 years accounted for 59.8 percent of Detroit's paralytic poliomyelitis cases (table 6). This percentage was highest in the central area (61.5 percent) and lowest in the outer area (41.3 percent). In the central area 80 percent of the patients with paralytic poliomyelitis were under 10 years of age. The majority of the paralytic cases, 55.8 percent, were in males. Fatalities were nearly three times as frequent in males as in females.

The average age of all patients reported as having poliomyelitis is shown in table 7.

## Area Characteristics

In this report, Detroit and Wayne County have been divided into three areas, the central

and outer areas of Detroit proper and the remainder of Wayne County (fig. 1).

The central area of Detroit is that portion of the city which is contained in a half circle pivoting about the foot of Woodward Avenue at the Detroit River in downtown Detroit and extending outward for approximately 5 miles. This area is made up of census areas A, B, C, D, K, L, and P. It is an area of low income and low economic status. Housing is for the most part old and population density is high. There are several modern housing developments in the area. Most of the residents are nonwhite. They move frequently within the city and, for the most part, have resided in Detroit less than 10 years. Very few are natives of Detroit, but there are also very few recent in-migrants. Many are unemployed and

**Table 2. Deaths from poliomyelitis in Detroit and Wayne County, Mich., by age, race, sex, and area, 1958**

Age (years)	Total	Race and sex				Area		
		White		Nonwhite		Detroit		Remainder of Wayne County
		Male	Female	Male	Female	Central area	Outer area	
All ages.....	25	5	2	13	5	21	2	2
0-4.....	7	0	0	5	2	7	0	0
5-9.....	2	0	0	0	2	2	0	0
10-14.....	2	1	0	1	0	1	0	1
15-19.....	2	1	0	1	0	2	0	0
20-29.....	3	2	0	1	0	3	0	0
30-39.....	7	1	0	5	1	5	2	0
40 and over.....	2	0	2	0	0	1	0	1

receive some form of public assistance. About 58 percent of Detroit's population lives in the central area, and about 92 percent of the paralytic cases and 67 percent of the nonparalytic were reported from this population. The vaccination rate in the central area was low. Families received an average of 0.71 dose of poliomyelitis vaccine. Among adults, only females had received vaccine, provided by the State during pregnancy.

The outer area of Detroit is made up of census areas E, F, G, H, I, and J in the northwest part of the city and M, N, and O in the northeast part. The outer area has a population of 806,000, about 42 percent of the population of Detroit proper. This is the higher economic portion of the city, although there

are neighborhoods which contain low-income families. Eight percent of the paralytic and 33 percent of the nonparalytic cases were reported from this area. The residents had a much higher vaccination rate than those in the central area. In the northwest part of the city, families with diagnosed poliomyelitis, mostly nonparalytic, had received 2.0 doses per person; children had received an average of 2.2 doses. As in the central area, most adults receiving vaccine were females.

The major portion of Wayne County is outside the city of Detroit, to the west and south. This area includes the cities of Hamtramck and Highland Park, which lie within the city limits of Detroit, as well as some communities along Lake St. Clair, to the east of the city. The county varies from highly industrialized to distinctly rural areas, and from top-level to low-economic residential areas. Only the city of River Rouge, with population characteristics similar to those of central Detroit, approached central Detroit's paralysis rate. The number of reported cases was also high in Wyandotte and Inkster. Dearborn, with a population of 115,000, had no paralytic cases. The vaccination rate in Wayne County was low.

**Table 3. Residual paralysis among reported cases of poliomyelitis in Detroit and Wayne County, Mich., 1958**

Type of poliomyelitis	Total	Detroit	Remainder of Wayne County
Total cases.....	874	649	225
Nonparalytic.....	462	303	159
Paralytic.....	412	346	66
Residual paralysis:			
None.....	69	56	13
Mild.....	113	95	18
Moderate.....	129	111	18
Severe.....	76	61	15
Death.....	25	23	2

#### Epidemic Management

Each development of the poliomyelitis epidemic was noted or anticipated. The public was kept informed through close working re-

Figure 2. Poliomyelitis cases reported in Detroit and Wayne County, Mich., by week of onset, 1958

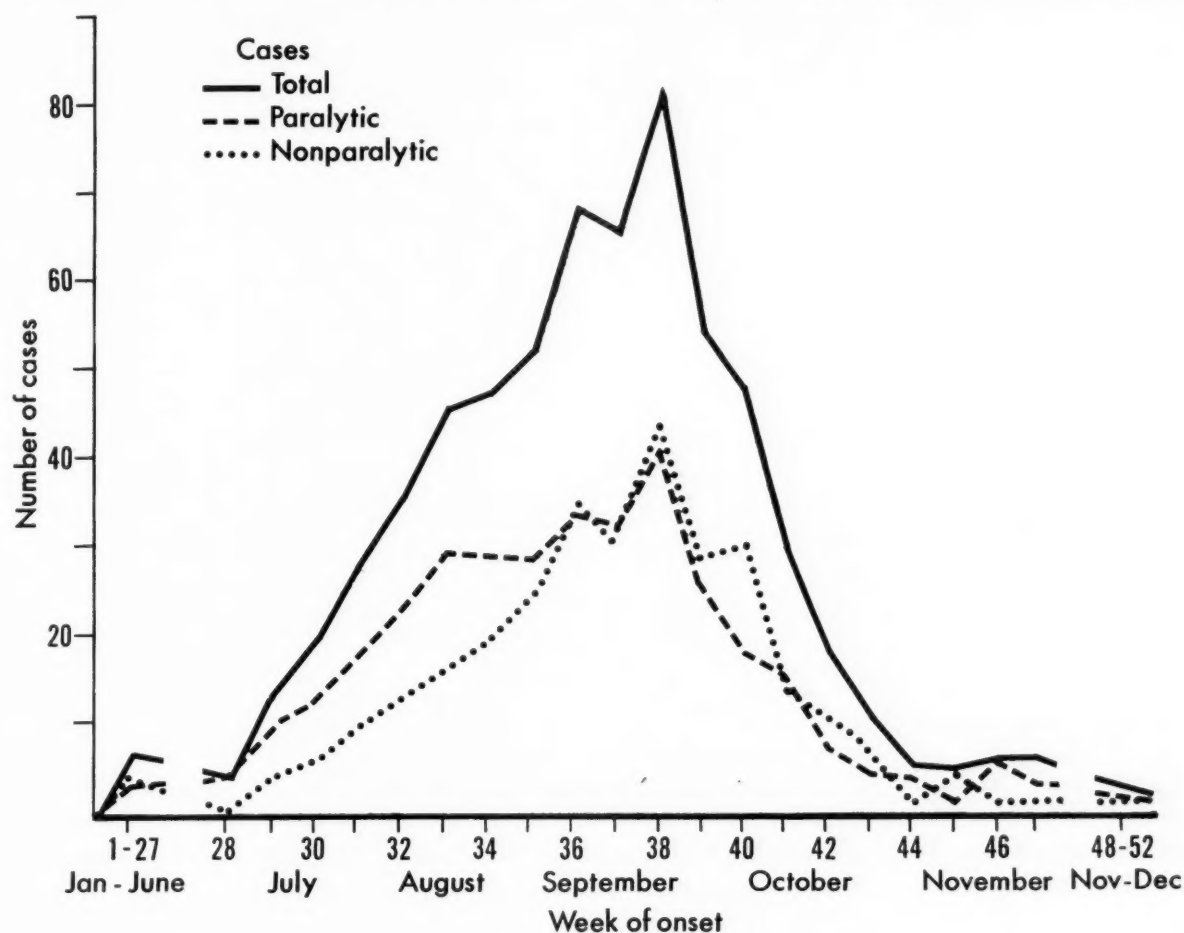


Table 4. Reported cases of poliomyelitis, by population and race, and reported deaths, Detroit, Mich., 1946-58

Year	Population	Reported cases						Deaths	
		Total	Rate per 100,000	White		Nonwhite		Number	Case fatality rate
				Number	Percent	Number	Percent		
1946	1,750,000	315	18.0	239	75.9	76	24.1	27	8.6
1947	1,785,000	219	12.3	188	85.8	31	14.2	6	2.7
1948	1,815,000	192	10.6	174	90.6	18	9.4	6	3.1
1949	1,825,000	553	30.3	521	94.2	32	5.8	27	4.9
1950	1,846,000	400	21.7	367	91.8	33	8.2	27	6.8
1951	1,896,000	371	19.6	311	83.8	60	16.2	11	3.0
1952	1,945,600	748	38.5	665	88.9	83	11.1	41	5.5
1953	1,995,650	559	28.0	503	90.0	56	10.0	25	4.5
1954	2,000,000	549	27.5	462	84.2	87	15.8	25	4.6
1955	1,902,000	249	13.1	200	80.3	49	19.7	2	.8
1956	1,910,000	151	7.9	92	60.9	59	39.1	2	1.3
1957	1,912,000	179	9.4	102	57.0	77	43.0	2	1.1
1958	1,900,000	649	34.2	247	38.1	402	61.9	23	3.5



**Table 5. Reported cases of poliomyelitis in Detroit, Mich., by type of disease,**

Age (years)	Total cases		Type of poliomyelitis				Sex			
			Nonparalytic		Paralytic		Male		Female	
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
All ages.....	649	100. 0	303	47. 7	346	53. 3	364	56. 1	285	43. 9
Under 1.....	40	6. 2	7	17. 5	33	82. 5	24	60. 0	16	40. 0
1-4.....	236	36. 4	62	26. 3	174	73. 7	137	58. 1	99	41. 9
5-9.....	166	25. 6	100	60. 2	66	39. 8	97	58. 4	69	41. 6
10-14.....	70	10. 8	52	74. 3	18	25. 7	45	64. 3	25	35. 7
15-19.....	41	6. 3	27	65. 9	14	34. 1	16	39. 0	25	61. 0
20-29.....	55	8. 5	29	52. 7	26	47. 3	27	49. 1	28	50. 9
30-39.....	32	4. 9	20	62. 5	12	37. 5	14	43. 8	18	56. 2
40 and over.....	9	1. 3	6	66. 7	3	33. 3	4	44. 4	5	55. 6

lationships with the press, radio, and television. This up-to-the-minute knowledge of the situation was a result of prompt reporting of disease and of early home visits for epidemiological study and followup. Medical histories pointed up the very low rate of vaccination of the victims of the epidemic. The areas hardest hit were noted.

This information was used as a basis for setting up a crash immunization program sponsored by the Wayne County Medical Society, the Detroit and Wayne County Departments of Health, and the National Foundation. The

program was directed primarily at the epidemic area. Poliomyelitis protection clinics were held in churches, schools, recreational centers, and libraries—wherever the public could best be served. A full course of three injections was made available to all, regardless of the patient's ability to pay.

The program, from its beginning in mid-August to the end of the year, resulted in the administration of more than 630,000 injections of poliomyelitis vaccine. On the basis of vaccine sales, it is estimated that about twice this number of doses were given by private physi-

**Table 6. Reported cases of paralytic poliomyelitis in Detroit, Mich., by age, sex, and race, 1958**

Age (years)	Total		Sex				Race			
			Male		Female		White		Nonwhite	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All ages.....	346	100. 0	193	55. 8	153	44. 2	75	21. 7	271	78. 3
Under 1.....	33	9. 5	21	63. 6	12	36. 4	5	15. 2	28	84. 8
1-4.....	174	50. 3	97	55. 7	77	44. 3	23	13. 2	151	86. 8
5-9.....	66	19. 1	34	51. 5	32	48. 5	16	24. 2	50	75. 8
10-14.....	18	5. 2	11	61. 1	7	38. 9	7	38. 9	11	61. 1
15-19.....	14	4. 0	5	35. 7	9	64. 3	4	28. 6	10	71. 4
20-29.....	26	7. 5	17	65. 4	9	34. 6	14	53. 8	12	46. 2
30-39.....	12	3. 5	7	58. 3	5	41. 7	3	25. 0	9	75. 0
40 and over.....	3	. 9	1	33. 3	2	66. 7	3	100. 0	0	. 0

# age, sex, and race, 1958

Race					
White			Nonwhite		
Number	Percent of—		Number	Percent of—	
	Age group	Total white cases		Age group	Total non-white cases
248	38.2	100.0	401	61.8	100.0
5	12.5	2.0	35	87.5	8.7
51	21.6	20.6	185	78.4	46.2
69	41.6	27.8	97	58.4	24.2
40	57.1	16.1	30	42.9	7.5
26	63.4	10.5	15	36.6	3.7
34	61.8	13.7	21	38.2	5.2
17	53.1	6.9	15	46.9	3.7
6	66.7	2.4	3	33.3	.8

cians, making a total of about 2 million injections.

In areas of high poliomyelitis incidence, 64.1 percent of the children returning to school in September had been vaccinated; 89.7 percent of the February 1959 entrants claimed such protection. In areas of low poliomyelitis incidence, the corresponding figures were 96.6 percent and 98.2 percent. Poliomyelitis protection is now available at health centers throughout the city on a weekly clinic basis, and an extensive school program has been set up.

About 85 percent of the cases of reported poliomyelitis in Detroit and Wayne County were cared for at Herman Kiefer Hospital, which is under the supervision of the Detroit Health Department. Both routine hospital care and diagnostic screening were the responsibility of the hospital's medical staff. Many cases came to the hospital from outside Detroit and Wayne County. As new admissions of acute poliomyelitis cases exceeded the capacity of the hospital, recently convalescent patients were transferred to other facilities. Routine followup examinations were done for patients 30 or more days after discharge.

## Epidemiology

In the Detroit epidemic, poliomyelitis sought its victims among the poorly vaccinated. There

was apparently little radial spread of the disease from one region to another in the heavily populated areas. Late in the season a shift to the rural areas of Wayne County was noted.

The number of doses and the date of injection of poliomyelitis vaccine were carefully determined for each reported case of poliomyelitis. In the city of Detroit, 95.1 percent of the patients with paralytic poliomyelitis had fewer than three inoculations of Salk vaccine, and 78.6 percent had no vaccine (table 8). Seventeen with paralytic poliomyelitis had three inoculations; none had four. None of the patients who died had had three inoculations.

A slightly different picture is seen in Wayne County outside Detroit. Here 74.2 percent of the patients with paralysis had received no vaccine, 83.3 percent had received fewer than three injections, and 11 patients, or 16.7 percent, had received three or more injections. One of the fatalities in Wayne County was an 11-year-old boy who had two injections of vaccine in 1955 and a third in 1957. This was confirmed from school records. There were no virus studies on this patient.

To measure the value of poliomyelitis vaccine,

**Table 7. Average age in years of reported cases of poliomyelitis in Detroit, Mich., for 1958, by sex, race, and type of disease**

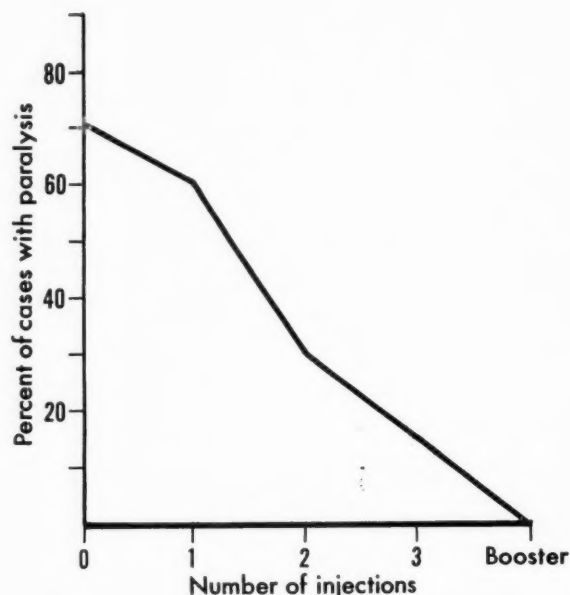
Sex	White	Non-white	Total
Nonparalytic			
Male.....	11.2	8.6	10.1
Female.....	15.8	10.6	13.5
Both sexes.....	13.2	9.5	11.6
Paralytic			
Male.....	14.8	5.5	7.2
Female.....	10.4	5.9	7.1
Both sexes.....	12.5	5.7	7.2
Nonparalytic and paralytic			
Male.....	12.1	6.5	8.6
Female.....	13.9	7.5	10.1
Both sexes.....	13.0	6.9	9.2

it would be helpful to know what proportion of the population was adequately protected in an area where the disease was epidemic, especially in the preschool age group. There are no easy means of determining those protected by virtue of inapparent infections, nor is the information obtained from informants concerning the individual's artificial immunization likely to be entirely correct. Such information needs careful verification. However, despite its limitations, the survey method represents a realistic approach to this problem. Serfling has formulated a useful sampling method for rapid survey of an area (3).

In order to have a basis for the effective promotion of immunization, a survey of current poliomyelitis immunity through vaccination was made in schools throughout Detroit. The index of relative vaccination coverage is indicated by the border in figure 1. While the data varied from school to school, on the average less than 50 percent of the children in elementary schools in the central area had had three inoculations of poliomyelitis vaccine. About 35 percent had had no vaccine at all. In the schools outside the central area a high protection level, indicated by the proportion of children having three or more inoculations, was demonstrated in well over 50 percent of the pupils. The correlation between the low rate of vaccination and the high incidence of paralytic poliomyelitis is graphically illustrated in figure 1. Because several immunization campaigns had been directed at the elementary school group in the central area during the preceding 3 years, apparently without marked success, a much lower state of immunization is believed to have existed in the preschool group at the time of the epidemic.

Studies made in Detroit and elsewhere have disclosed that not one but a variety of reasons were given to explain the lack of adequate protection against poliomyelitis through artificial immunization (4). Major factors seemed to be apathy, indifference, lack of "health awareness," ignorance of the facts concerning vaccination, outright opposition, or, in some instances, definitely expressed fear as to the safety of the procedure and of the vaccine. The unvaccinated group were not motivated by the usual mass media, such as newspapers, televi-

**Figure 3. Paralysis rates related to number of injections of Salk poliomyelitis vaccine among reported cases of poliomyelitis, Detroit, Mich., 1958**



sion, or radio, employed to promote immunization. Inability to pay for vaccination because of marginal income or unemployment, which was clearly evident in many instances, need not have been a deterrent. Clinics were available without cost and were close at hand; still they were not used. The lack of protection among young fathers was not limited to the central area of the city and would seem to indicate a serious failure of mass media to educate the entire public to the need for protection against poliomyelitis.

#### **Herman Kiefer Hospital Admissions**

Each year the communicable disease division of the Herman Kiefer Hospital admits more than 80 percent of all reported cases of poliomyelitis from the Detroit metropolitan area. This area includes the city of Detroit, and Wayne, Oakland, and Macomb Counties.

During 1958, 867 poliomyelitis patients were admitted to the hospital, 853 of them during the period July to November, and 955 patients were examined and returned to the care of private physicians. Of the 874 cases of poliomyelitis reported in Detroit and Wayne County, 742, or 84.8 percent, were cared for at Herman



Kiefer Hospital. The maximum number of patients admitted in one week was 117, during the week ending September 17. There were only 10 admissions through July 16. Many cases came from outside Detroit and Wayne County.

The 1958 hospital admissions were distributed as follows:

Area	Number cases	Number deaths
Detroit city-----	534	17
Remainder of Wayne County -----	208	2
Macomb County -----	76	6
Oakland County -----	45	0
Other -----	4	0
Total -----	867	25

Males exceeded females in all age groups. About 53 percent of the paralytic cases occurred in the 0-4 year age group; almost 60 percent were among nonwhites (table 9).

Forty percent of poliomyelitis admissions were for paralytic poliomyelitis (table 9) 84 percent of these patients had spinal involvement (table 10). Tracheotomies were performed on 27 patients, 18 of them males. Respirator cases numbered 54 (table 11). Thirty-eight were in males, and of these, 23 were nonwhite. Nine of the females were white. Most respirator cases were in the group aged 20 years and over.

Fatalities among patients admitted to the hospital numbered 25 (table 11). Twenty were

**Table 8. Number and percent of Salk vaccine injections<sup>1</sup> among all cases and among paralytic cases of poliomyelitis, by sex and race, Detroit, Mich., 1958**

Number of injections	Total		Males		Females		White		Nonwhite	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All cases										
0-----	365	59.3	214	58.8	171	60.0	103	41.5	282	70.3
1-----	55	8.5	33	9.1	22	7.7	18	7.3	37	9.2
2-----	81	12.5	44	12.1	37	13.0	27	10.9	54	13.5
3-----	121	18.6	71	19.5	50	17.5	94	37.9	27	6.7
4-----	7	1.1	2	.5	5	1.8	6	2.4	1	.3
Total-----	649	100.0	364	100.0	285	100.0	248	100.0	401	100.0
Average-----	0.94		0.94		0.93		1.52		0.57	
Paralytic cases										
0-----	272	78.6	154	79.8	118	77.1	54	72.0	218	80.5
1-----	33	9.6	17	8.8	16	10.5	8	10.7	25	9.2
2-----	24	6.9	12	6.2	12	7.8	2	2.7	22	8.1
3-----	17	4.9	10	5.2	7	4.6	11	14.6	6	2.2
4-----	0	.0	0	.0	0	.0	0	.0	0	.0
Total-----	346	100.0	193	100.0	153	100.0	75	100.0	271	100.0
Average-----	0.38		0.37		0.40		0.60		0.32	

<sup>1</sup> The peak of poliomyelitis cases occurred during an intensive Salk vaccine inoculation drive which was instituted in mid-August following several weeks of sustained high incidence of poliomyelitis cases to raise the antipoliomyelitis immune state in the general population and thus possibly to abort the epidemic. Thus, many persons received poliomyelitis vaccine inoculations at time of onset of poliomyelitis or after onset. Since the inoculations were received too late to affect resistance to infection, these inoculations were considered, for analytic purposes, as not having been received. Statistical tests indicated that inoculations received at time of or following onset of poliomyelitis did not prevent or cause infection or paralysis, nor did these inoculations modify or enhance the extent of residual paralysis among paralytic cases.

For the most part, these inoculations have been verified by a check of health department clinic records and by confirmation by private physicians who gave inoculations to patients. In less than 10 percent of the cases were statements by parents or guardians the sole verification accepted.

NOTE: For nonparalytic cases the average number of injections was 1.6. Adults and children received about the same average number.

## Use of an Aluminum Phosphate Vaccine

There has been some discussion as to whether it is advisable to inoculate infants with vaccines using aluminum phosphate (or alum) as the mineral carrier during and immediately preceding the "polio season" because of the possibility of such agents "provoking" paralytic poliomyelitis in subsequently exposed individuals. Hill and Knowelden reported this phenomenon in the *British Medical Journal* for July 1, 1950, in reference to children receiving their first dose of diphtheria, tetanus, pertussis (DTP) vaccine within a month or so of the seasonal incidence of poliomyelitis in Great Britain.

Quite inadvertently, we were able to observe the experience of infants receiving such a substance just prior to the 1958 epidemic of poliomyelitis in Detroit and Wayne County, Mich. During the spring of 1958, the Detroit Department of Health had initiated a rather extensive clinical trial of Quadrigen, a multiple antigen containing poliomyelitis, diphtheria, tetanus, and pertussis antigens adsorbed onto aluminum phosphate. In this study 446 infants, ranging in age from birth through 6 months at the time they were placed on their primary series of inoculations, received four inoculations of Quadrigen at monthly intervals. Another 211 infants of the same age range were placed on a similar course of a standard DTP vaccine, in which aluminum phosphate was also the mineral carrier.

All children received their first dose in April, their second in May, their third in June, and completed their fourth dose by mid-July 1958. A single dose of Quadrigen was given to 460 children from both groups who returned for their "booster" in January 1959.

The Detroit poliomyelitis epidemic occurred between July and November 1958, reaching its peak in mid-September. This was Detroit's worst outbreak of paralytic poliomyelitis since 1952, with 346 reported paralytic cases in the city, nearly 10 percent of which occurred in infants under 1 year of age. Virus isolation studies performed by Dr. Gordon Brown of the University of Michigan on a number of patients revealed a preponderance of type 1 poliovirus infections (77 percent type 1 isolated from stools), with type 3 found to a lesser extent (23 percent type 3 isolated from stools). Type 2 apparently was not involved. Most of the children receiving Quadrigen or DTP antigen in the study

population came from homes in the geographic areas of the city hardest hit by the epidemic.

Because of the 211 children receiving DTP antigen but no poliomyelitis vaccine before or during this epidemic (these children received their poliomyelitis vaccine inoculations January through April of 1959), we were able to measure the impact of the epidemic on our study population. Blood tests revealed that 42 of these children experienced an unexplained but significant rise in antibody titer to type 1 poliovirus and to a lesser extent to type 3 after their primary series of DTP inoculations and before their booster dose of Quadrigen. This rise was also seen in the Quadrigen-inoculated groups. Among infants showing an unexplained rise in poliovirus antibody titer, a rise in type 1 antibody titer occurred in 73 percent (109 of 150 determinations), and in type 3 in 27 percent. No such phenomena occurred in respect to type 2 antibody levels. This serologic pattern in the controls would seem to confirm the virus isolation studies of Dr. Brown and, if this presumption is correct, definitely indicates that our study population received a heavy exposure to type 1 virus and to some extent to type 3.

Naturally, we have been concerned as to whether any of our study babies contracted poliomyelitis, and we are happy to report, after an extensive review of our records, that none of these children contracted clinically recognizable poliomyelitis either during this epidemic or at any time since. From this limited but timely experience we are in a position to say there is no apparent provocative effect from intramuscular immunizations with Quadrigen or DTP preparation with A1P04 in precipitating paralytic poliomyelitis infection in a child. We know of no reason why these observations would not apply with equal validity to poliomyelitis vaccine preparations using aluminum phosphate as a mineral carrier. We have also had these preparations under clinical investigation. Results of these studies are in preparation for a paper which will be submitted for publication in the near future.—JOSEPH G. MOLNER, M.D., M.P.H., *health commissioner, City of Detroit*, and C. DALE BARRETT, JR., M.D., M.P.H., *director of maternal and child health, Detroit Department of Health*.

among males, and of these, 10 were white. Deaths among females numbered five; three were white. Fourteen deaths occurred in the 20-year and over age group; 11 were males. Of the six deaths among nonwhites, five were in males.

The admitting-room service functioned as a diagnostic and screening agency. During an epidemic of poliomyelitis-like illness a discussion of the differential diagnosis between non-paralytic poliomyelitis, aseptic meningitis, and Coxsackie or ECHO virus infection is completely academic. Any patient with any signs and symptoms that might be those of poliomyelitis was admitted to the nearest hospital, where observations and treatment could be given as needed.

The classic, biphasic type of onset was seldom seen in this epidemic. The duration of illness prior to examination ranged from 1 to 7 days, the majority ranging from 2 to 4 days. The most common symptoms were severe headache, vomiting, malaise, and generalized aching. Upper respiratory tract symptoms were common.

Physical findings included stiffness of the neck and back of varying severity and a temperature of 100° to 103° F. and higher in patients with bulbar or intercostal involvement. Many patients were paralyzed at the time of admission. Five cases exhibited a mild, discrete, morbilliform rash.

Acute and convalescent phase blood specimens and a stool specimen from 556 patients

**Table 9. Type of poliomyelitis among patients admitted to Herman Kiefer Hospital, Detroit, Mich., during 1958, by age, sex, and race**

Age, sex, and race	Total	Nonparalytic	Paralytic
Total cases -----	867	520	347
<i>Age (years)</i>			
0-4 -----	285	102	183
5-9 -----	215	146	69
10-19 -----	185	142	43
20 and over -----	182	130	52
<i>Sex</i>			
Male -----	495	307	188
Female -----	372	213	159
<i>Race</i>			
White -----	512	372	140
Nonwhite -----	355	148	207

**Table 10. Type of paralytic poliomyelitis among patients admitted to Herman Kiefer Hospital, Detroit, Mich., by sex, 1958**

Type of paralytic poliomyelitis	Total	Male	Female
Total cases -----	347	188	159
Spinal -----	292	151	141
Bulbar -----	17	10	7
Spinobulbar -----	29	21	8
Encephalitic and other -----	9	6	3

**Table 11. Tracheotomies, respirator cases, and deaths among poliomyelitis patients admitted to Herman Kiefer Hospital, Detroit, Mich., by sex, 1958**

	Total	Male	Female
Tracheotomies -----	27	18	9
Respirator cases -----	54	38	16
Deaths -----	25	20	5

were subjected to virus studies (table 12): 433 stools and 112 paired blood specimens were examined; 11 examinations were incomplete (5).

Type 1 and type 3 polioviruses were obtained from the stools of paralytic patients, with type 1 predominating (table 12). No type 2 virus was recovered. Poliovirus was recovered from the stools of 72.0 percent of the paralytic cases and from 20.2 percent of the nonparalytic cases. Positive virus findings correlated fully with the clinical diagnoses in the paralytic cases. Recovery of poliovirus from nonparalytic cases in the Detroit central area exceeded considerably the recovery of other identifiable viruses, with the reverse being true outside the central area. More comprehensive laboratory data, from specimens collected throughout Michigan during 1958, have been reported by Brown and associates (5).

A majority of the patients with nonparalytic disease were hospitalized for 7 to 10 days. A few with extreme stiffness required hot packs and physical therapy for several weeks. The minimum period of hospitalization for patients with paralytic poliomyelitis was 14 days. Twenty patients, all with severe involvement, required very extensive treatment. It was the



impression of clinicians at the hospital, based on carefully obtained histories, that trauma and fatigue apparently played a very minor role in production of paralysis in the cases seen during 1958.

Two cases of poliomyelitis frequently occurred in the same family. In September, four members of a family, the father and three children, were admitted to the hospital. The father had paralysis of all extremities and intercostal muscles and required treatment in a respirator. One of the children had paralysis of a lower extremity; the other two were nonparalytic.

Three patients returned to the hospital with second attacks of poliomyelitis. Two were nonparalytic in type during both admissions. Poliovirus was recovered from the stools of both of these patients on both first and second admissions. Each illness was caused by a virus

of different type. The third patient had nonparalytic disease on the first admission and encephalitis plus paralysis of a lower extremity on the second.

During September, it was necessary to transfer convalescents to general hospitals, convalescent centers, and the rehabilitation center in Detroit, in order to obtain space for acute cases.

### Summary and Conclusions

During 1958 Detroit and Wayne County, Mich., experienced a poliomyelitis epidemic which contrasted sharply with the racial and regional occurrence of this disease characteristic of outbreaks in the past.

The epidemic commenced late in July, reached a peak in September, and ended in

**Table 12. Virus isolations from stools of 556<sup>1</sup> poliomyelitis patients treated at Herman Kiefer Hospital, Detroit, Mich., 1958**

Area	Total stools examined	Virus isolated									
		Poliomyelitis					Other				
		Number			Per-cent	Positive			Negative		
		Type 1	Type 3	Total		Number			Per-cent	Num-ber	Per-cent
						Cox-sackie	ECHO	Total			
Paralytic cases <sup>2</sup>											
Detroit:											
Central area.....	169	93	31	124	73.4	0	0	0	0	45	26.6
Outer area.....	17	10	0	10	58.8	0	0	0	0	7	41.2
Remainder of Wayne County..	39	26	2	28	71.8	0	0	0	0	11	28.2
Total.....	225	129	33	162	72.0	0	0	0	0	63	28.0
Nonparalytic cases											
Detroit:											
Central area.....	97	23	8	31	31.9	5	17	22	22.7	44	45.4
Outer area.....	52	4	0	4	7.7	2	7	9	17.3	39	75.0
Remainder of Wayne County..	59	5	2	7	11.7	0	13	13	22.1	39	66.2
Total.....	208	32	10	42	20.2	7	37	44	22.2	122	58.6
Grand total.....	433	161	43	204	47.1	7	37	44	10.2	185	42.7

<sup>1</sup> Paired blood specimens only were examined from 112 patients; examinations of 11 were incomplete.

<sup>2</sup> Paralytic cases received 60-day followup.

November. The final count showed 412 paralytic cases and 25 fatalities. More than three-quarters of the paralytic cases were concentrated in the central area of the city and largely involved a Negro population of low economic status. Sixty percent of the paralytic victims of the disease in Detroit had not yet reached their fifth birthday. Those in their second year of life were most susceptible.

The epidemic was due to type 1 and type 3 polioviruses, with type 1 predominating. Victims of paralytic disease had received little or no Salk vaccine. A crash immunization program was inaugurated during the epidemic. Well-advertised poliomyelitis protection clinics were set up throughout the county but were especially concentrated in the epidemic areas.

The pattern of poliomyelitis in a large city and community 4 years after Salk vaccine became available demonstrates the high level of protection afforded by the recommended number of doses of this vaccine. On the basis of effort directed at all levels of the population and a high per capita rate of inoculation with Salk vaccine, it had been believed that protection against poliomyelitis was at a safe level in Detroit. However, the distressing epidemic occurrence of paralytic poliomyelitis in infants and children concentrated largely in low-income groups evidenced not only pockets of the population which had received little or no vaccine but also demonstrated the cyclic, unpredictable character of the disease in those who lacked adequate protection.

An outbreak of poliomyelitis as severe as that which occurred in Detroit can best be prevented by searching for pockets of low artificial pro-

tection, making vaccination readily available to all, and, for some elements of the population, resorting to intensive personal persuasion or education to encourage inoculation. The peak occurrence of the paralytic cases in the second year of life indicates not only the urgent need to give protection as early in infancy as is possible, but offers a key to prevention of epidemics. Since births are a matter of public record, the effective followup of every infant during its first year of life seems the logical approach to building solid protection against poliomyelitis into a community.

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## Search for Energy Sources

Solar and nuclear energy were among the topics discussed at the International Conference on Science in the Advancement of New States which was held August 15-30, 1960, at the Weizmann Institute of Science, Rehovoth, Israel. More than 500 statesmen, scientists, scholars, and observers, representing 31 countries and 5 continents, attended the conference.

Dr. Alvin M. Weinberg, director of the Oak Ridge National Laboratory at Oak Ridge, Tenn., spoke on the eventual possibility of achieving autarky in energy by the use of breeder reactors, which manufacture more fuel than they consume.

Weinberg said he did not wish to encourage the statesmen present at the conference to go into the nuclear business in their new states. He urged that most of them wait until breeder reactors have been developed further, suggesting their use might become economically feasible in certain areas within 15 years. He also warned about the danger of starting large-scale nuclear energy programs until the problem of radioactive waste disposal had been solved.

"I think an economically autarkic world would be a more stable place than an economically interdependent world," Weinberg stated. "There are many examples of how concern for the supplies needed to produce energy or for other raw materials has led to acute anxiety and tension. The Suez crisis in 1956 is only one of many such crises which can be traced to worry over energy-producing materials. One need only imagine the course of events at Suez had all the countries involved at the time been truly self-sufficient in regard to energy. If their energy systems had been based on domestic uranium and thorium and the problem of converting nuclear energy into petrochemicals had been solved, it is hard to see how access to the Middle East could have become a major political issue."

The paper presented by Dr. Henry Tabor of the National Physical Laboratory of Israel dealt with solar energy as a source of power.

Tabor described a solar pool built to employ his system near the Dead Sea Works at S'dom. Salts are dissolved at the bottom of the pool, making the bottom layer of water heavier and preventing it from rising to the surface even when it has become hotter. Although the top layer remains at a stable temperature because it loses heat at the same rate as it picks it up, the lower level of water gradually gets hotter if it is undisturbed.

Tabor reported that a solar pool covering 1 square kilometer would produce heat valued at \$300,000 annually and would cost \$1 to \$1.5 million to construct. He estimated that such a pool would produce 6,000 kilowatts of electricity whenever the sun was shining. The cost of installed capacity would be only about \$250 per kilowatt, less than the estimated cost per kilowatt of production by nuclear power stations when they become operative.

He pointed out that most undeveloped countries have considerable quantities of flat land, salt, and hot sun, the three requirements for building solar pools. Salt is frequently present in flat areas, where very large pools could be built, and there are tens of thousands of square kilometers of such land in the world.

Three urgent needs of new states in the next 15 years were emphasized in discussions following the regular sessions of the conference:

1. Short-range programs carried out with the help of societies wealthier in capital and know-how, rather than long-range benefits from science.
2. Immediate training of administrative and technological personnel.
3. Small power rather than huge energy reactors. In this connection, Tabor's solar pool and the suggestion that wind power might be usable produced favorable response.

Discussion of desalination of sea water also impressed conference delegates, many of whom came from new states suffering shortage of sweet water.



# Racial Differences in Visual Acuity

BERNARD D. KARPINOS, Ph.D.

CERTAIN VISUAL STANDARDS have been established by the Armed Forces in determining an individual's qualification for military service (1). Consequently, testing of vision constitutes an integral part of the medical examinations conducted by the Armed Forces examining stations.

The current visual standards with respect to induction or enlistment for military service are expressed in terms of distant vision. The following procedures are prescribed by the Army regulations in regard to testing visual acuity (1):

Visual acuity will be determined at a distance of 20 feet or the mirror equivalent under standard conditions of illumination. The illumination of the target chart shall be between 12- and 18-foot candles. This degree of illumination may be obtained by a 200-watt lamp, 5 feet diagonally from the 20/20 line in the target, and incident to this part of the chart at an angle of 45°. All lamps must be shielded from the direct vision of the examinee by an opaque shade. The individual to be tested, if wearing glasses, will remove them before entering the examining room, and then will be seated without viewing the test chart. Individuals awaiting the test must be kept out of hearing distance. The examiner holds the occluder and covers the candidate's left eye, while instructing the examinee to keep both eyes open without squinting. The occluder must not be permitted to touch any part of the eye to be shielded, but will be held in contact with the side of the nose. The examinee is then directed to begin with the first (visible) line and to read as many as possible. The acuity for the left eye is then tested, using a different chart or by having the examinee read the lines backward. An individual who normally wears glasses is tested again with them in place, following the same procedure. Where there is a suspicion that the examinee has memorized the charts, he is directed to read the letters or targets

in reverse order or will be shown a different chart. The individual is expected to read the letters promptly. No precise time limit will be applied, but 1 or 2 seconds per letter is ample time. When an individual fails a letter or target, he will not be asked to read it again. If the individual is a rapid reader and his mistakes are obviously careless ones, he will be cautioned to "slow down" and the test will be repeated on another chart. Vision is recorded in the form of a fraction. The upper number is the distance in feet from the target, and the lower number is the value of the smallest test chart line read correctly. Thus a person reading the 30-foot test chart line at a distance of 20 feet is given a score of 20/30. A score of 20/20 indicates the person reads test chart line marked 20 at a distance of 20 feet. Similarly, 20/200 means that person reads only the test chart line marked 200 from a distance of 20 feet.

The findings of the visual testing are recorded on the examinee's medical examination report (Standard Form 88, item 59), for each eye separately. Both the examinee's uncorrected and correctable distant vision are recorded, in Snellen notation. The following analysis of racial differences in visual acuity is based on these findings.

## The Sample

The analysis deals with Selective Service registrants examined by the Armed Forces examining stations during the 21-month period from January 1957 through September 1958. The stations are required to submit to the Office of the Surgeon General, Department of the Army, a copy of the medical examination report of each registrant disqualified by them for military service and of each qualified registrant inducted into the Army.

During this period, 50 percent of the submitted medical reports were coded for use in the study. To assure randomness, the sample was selected by taking all reports of the disqualified registrants whose Selective Service

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number assigned to them by their local boards ended in an odd digit, and all reports of the inducted registrants whose Armed Forces service number ended in an odd digit. The sample included some 276,000 medical reports. The medical and personal data coded from these reports were put on punchcards.

Visual data, involving one or both eyes, were missing on 2.0 percent of the medical examination reports of disqualified registrants (2.1 percent for whites and 1.8 percent for Negroes) and on 0.2 percent of those of inducted registrants (0.2 percent for whites and 0.3 percent for Negroes). Eliminating these, the final sample used in the analysis comprised some 273,000 medical reports of registrants with known distant vision. These reports were distributed as follows by race and military qualification of the examinees:

Race	Disqualified	Inducted	Total
White (non-Negro) -----	109,516	111,794	221,310
Negro -----	36,893	14,389	51,282
Total -----	146,409	126,183	272,592

These examinees presented a young population: the mean age (as of last birthday) of the white examinees was computed as 21.8 years, and that of the Negro as 21.6 years. Somewhat more than one-half of both white and Negro examinees were 22 years of age (table 1).

#### Data Tabulated and Adjusted

From the coded visual data the following cross-tabulations were prepared for each of the four groups—white disqualified, white inducted, Negro disqualified, Negro inducted:

Uncorrected vision of right eye by uncorrected vision of left eye.

Uncorrected vision of right eye by correctable vision in the same eye.

Uncorrected vision in left eye by correctable vision in the same eye.

To carry out the analysis of the total examined groups by race, the cross tabulations of the disqualified examinees, by race, had to be combined with those of the inductees who were taken as representative of the total qualified group.

These cross-tabulations indicated differences in distant vision between races, as well as be-

**Table 1. Percentage distribution of registrants examined for military service by age and race, January 1957–September 1958**

Age <sup>1</sup>	White	Negro
All ages-----	100.0	100.0
Under 18-----	0.8	1.0
18-----	6.6	9.3
19-----	7.7	7.6
20-----	5.7	4.9
21-----	17.5	19.3
22-----	53.3	53.0
23-----	5.2	3.2
24-----	1.9	.9
25-----	1.2	.6
26-----	.1	.2
Mean age (years)-----	21.8	21.6

<sup>1</sup> As of last birthday.

SOURCE: Medical examination reports (Standard Form 88) of registrants examined for military service by the Armed Forces examining stations.

tween disqualified and inducted examinees within each race. Because of these differences, it was necessary, prior to combining the distributions, to ascertain that these groups are properly represented for analysis. This was done on the basis of monthly reports, Summary of Registrant Examinations for Induction (DA Form 316), submitted by each Armed Forces examining station in addition to the individual medical reports. From these monthly reports, the following ratios of disqualified to qualified registrants (excluding disqualifications for administrative, primarily moral, reasons) were established for this period of January 1957 through September 1958: White, 2,031 qualified and 1,000 disqualified; Negro, 555 qualified and 1,000 disqualified. The examinees disqualified for administrative reasons were excluded because no medical data are available for most of them.

The ratios of inductees to those disqualified in our study were obviously different from the ratios derived from the monthly reports. These differences stem from the fact that the medical reports of qualified registrants are received only for those who are inducted. Certain numbers of those who qualify enlist prior to induction; others may not be called up at all. The medical reports of these qualified registrants are not available. Hence, it was

necessary for proper evaluation of the data to weight the separate cross-tabulations to agree with the ratios obtained from the monthly reports. The weighting actually resulted in multiplying the cross-tabulations of the white inducted registrants by 1.99 and those of the Negro inductees by 1.42, cell by cell, and then combining these adjusted cross-tabulations with the corresponding cross-tabulations of the disqualified examinees. Obviously, the assumption was made that the distributions of all qualified registrants by visual acuity were the same as those who were qualified and inducted, a reasonable assumption.

#### Uncorrected Distant Vision

From the combined (weighted) cross-tabulations of uncorrected vision by right and left

eyes, separate cross-tabulations were derived for white and Negro examinees (table 2). The distributions are shown to a base of 100,000 for white and 10,000 for Negro examinees. The difference in the bases is due to the difference in the total numbers involved.

Vision marked in the table as less than 20/400 includes light perception; blind includes missing eye. No persons blind in both eyes are indicated by the table, since such persons are ordinarily screened out by the local boards before being forwarded to the examining stations.

These distributions clearly reveal relatively poorer distant vision for the white than for the Negro examinees. For instance, as shown in table 2, 69 percent of the white examinees had 20/20 uncorrected bilateral vision compared

**Table 2. Distribution of registrants examined for military service by uncorrected distant vision in right and left eyes, by race, January 1957–September 1958**

Vision in left eye <sup>1</sup>	Vision in right eye <sup>1</sup>										
	20/20	20/30	20/40	20/50	20/70	20/100	20/200	20/400	<20/400	Blind	Total
<i>White</i>											
20/20	69,348	2,289	380	212	270	152	235	281	104	104	73,375
20/30	2,576	4,259	615	220	219	102	127	82	32	14	8,246
20/40	416	559	920	273	240	91	77	46	17	5	2,644
20/50	228	223	223	557	251	94	75	23	11	2	1,687
20/70	326	228	228	214	996	299	183	55	24	4	2,557
20/100	189	120	101	94	269	1,015	389	92	31	3	2,303
20/200	295	126	75	86	183	303	2,282	370	114	8	3,842
20/400	349	99	43	30	67	77	322	1,957	649	5	3,598
<20/400	130	40	18	13	26	29	114	678	569	4	1,621
Blind	84	12	5	2	5	4	6	4	5	-----	127
Total <sup>2</sup>	73,941	7,955	2,608	1,701	2,526	2,166	3,810	3,588	1,556	149	100,000
<i>Negro</i>											
20/20	8,217	195	28	15	14	7	14	18	12	11	8,531
20/30	220	412	41	14	11	5	3	4	2	1	713
20/40	33	49	78	16	12	3	2	2	1	-----	196
20/50	17	16	16	38	12	4	1	1	1	-----	106
20/70	18	12	10	9	53	13	5	2	1	-----	123
20/100	9	5	4	3	9	38	11	1	2	-----	82
20/200	13	5	2	1	4	7	66	8	4	-----	110
20/400	18	3	1	1	2	1	5	30	14	1	76
<20/400	12	2	1	1	1	1	3	15	13	-----	49
Blind	11	2	-----	-----	-----	-----	1	-----	-----	-----	14
Total <sup>3</sup>	8,568	701	181	98	118	79	111	81	50	13	10,000

<sup>1</sup> Snellen notation.

<sup>2</sup> Base used is 100,000.

<sup>3</sup> Base used is 10,000.

SOURCE: Medical examination reports (Standard Form 88) of registrants examined for military service by the Armed Forces examining stations.

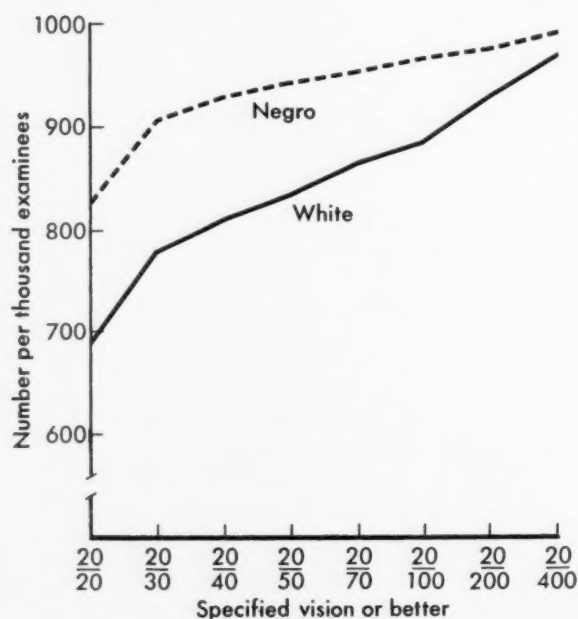


with 82 percent of the Negro examinees. This fact of comparatively poorer vision of the white examinees is more distinctly shown in table 3 and figure 1, derived from table 2.

Uncorrected vision of less than 20/40 is ordinarily taken as point of departure to indicate defective vision. Table 3 shows that 81 percent of the white examinees had 20/40 vision or better in each eye, or 87 percent had such vision or better in at least one eye. The corresponding data for the Negro examinees indicate 93 percent having 20/40 vision or better in each eye, and 96 percent having such vision or better at least in one eye. In other words, 19 percent of the white examinees had less than 20/40 vision in the worse eye, or 13 percent in the better eye. Of the Negro examinees, only 7 and 4 percent had less than 20/40 vision in the worse or better eye, respectively.

Similar differences by race have been indicated by previous studies (2-4). The first (2), relating to low-income farm families, revealed such differences for each age group, within the age range from 5 to 65 years and over. These findings seemed to suggest that these differences could be primarily genetic (or racial) in origin. On the other hand, there are indirect

**Uncorrected distant vision, both eyes, in registrants examined for military service, by race, January 1957-September 1958**



**Table 3. Distribution of registrants examined for military service by specified uncorrected distant vision or better, by race, January 1957-September 1958**

Snellen notation	Number per 1,000 examinees <sup>1</sup>			
	In each eye		At least in one eye	
	White	Negro	White	Negro
20/20 or better.....	693	822	780	888
20/30 or better.....	784	904	850	947
20/40 or better.....	814	927	874	962
20/50 or better.....	833	941	889	969
20/70 or better.....	863	956	910	978
20/100 or better.....	888	966	929	984
20/200 or better.....	932	979	961	993
20/400 or better.....	971	989	994	993

<sup>1</sup> Derived from table 2.

indications that these differences may be environmental in origin. Studies of inductees (5,6) indicate a certain association between mental group and defective vision. It seems that the higher the mental group, the larger the relative proportion of individuals with defective vision. (These studies indicated for the higher mental groups I and II, as determined by the Armed Forces Qualification Test, proportionally more in physical categories B and C, which consist principally of inductees with defective vision.) All in all, however, it still remains an open question whether these racial differences in visual acuity are genetic in origin, or are the results of later environmental development, or are due to both.

#### Correctability Potentials

The visual standards of this period have been expressed in terms of both uncorrected and correctable vision. With respect to correctable vision, the minimum visual requirements for acceptance into military service were correctable vision of 20/40 in one eye and 20/70 in the other eye, 20/30 in one eye and 20/100 in the other eye, or 20/20 in one eye and 20/400 in the other eye (1).

In addition to these minimum requirements, standards of correctable vision have been also established for profiling (grading) those whose correctable distant vision is above the minimum

requirements. There are three grades to this profiling, ranging from grade 1, the highest, to grade 3, the lowest. A general discussion of profiling is presented by the author in another article (7). During this period, grade 1, for instance, required correctable vision of 20/20 in one eye and 20/30 in the other eye. By these various profiling visual standards, the Army regulations thus provided for recording the highest possible correctable distant vision. Toward this end, each Armed Forces examining station has been equipped with a large trial lens-set. However, there might have been cases, especially if the minimum visual requirements were met, in which the medical examiner could have recorded the distant vision, as corrected by the examinee's own glasses, as correctable vision, without further testing. This could have led in some cases to understating correctability. Notwithstanding this fact, the correctable vision as recorded on the medical examination reports may, by and large, be taken as a reliable index of potential correctability.

In combining the cross-tabulations of uncorrected by correctable distant vision of the disqualified examinees with those of the inducted examinees for the purpose of obtaining corresponding distributions relating to the total examinees, the tabulations were weighted in the same manner as the cross-tabulations of uncorrected distant vision by right and left eyes. From the combined cross-tabulations of uncorrected versus correctable distant vision, probabilities of correctability were initially computed separately for the right and left eyes. A statistical evaluation of these separate probabilities indicated no significant differences between them. In other words, there is an equal chance for a specified defective vision to be corrected to a specified better vision, irrespective of whether it is that of the right or left eye. The probabilities of correctability (table 4) were hence computed by combining the weighted cross-tabulations of uncorrected versus correctable vision of the right eye with those of the left eye. These probabilities are presented sep-

**Table 4. Probabilities of correctability of a given distant vision to a given correctable distant vision, but not better, by race, January 1957-September 1958**

Best correctable distant vision <sup>1</sup>	Uncorrected distant vision						
	20/40	20/50	20/70	20/100	20/200	20/400	<20/400
<i>White</i>							
20/20-----	0. 686	0. 590	0. 611	0. 595	0. 610	0. 578	0. 322
20/30-----	. 270	. 296	. 235	. 217	. 199	. 232	. 223
20/40-----	. 044	. 079	. 087	. 092	. 072	. 066	. 089
20/50-----		. 035	. 032	. 030	. 024	. 020	. 036
20/70-----			. 035	. 040	. 030	. 026	. 036
20/100-----				. 026	. 029	. 017	. 021
20/200-----					. 036	. 025	. 026
20/400-----						. 036	. 024
<20/400-----							. 223
Total-----	1. 000	1. 000	1. 000	1. 000	1. 000	1. 000	1. 000
<i>Negro</i>							
20/20-----	. 636	. 450	. 501	. 490	. 497	. 385	. 088
20/30-----	. 309	. 371	. 271	. 205	. 172	. 224	. 119
20/40-----	. 055	. 115	. 124	. 145	. 113	. 109	. 104
20/50-----		. 064	. 048	. 039	. 033	. 041	. 049
20/70-----			. 056	. 059	. 062	. 047	. 033
20/100-----				. 062	. 054	. 050	. 035
20/200-----					. 069	. 079	. 040
20/400-----						. 065	. 040
<20/400-----							. 492
Total-----	1. 000	1. 000	1. 000	1. 000	1. 000	1. 000	1. 000

<sup>1</sup> Snellen notation.

SOURCE: Medical examination reports (Standard Form 88) of registrants examined for military service by Armed Forces examining stations.

arately by race. More details with respect to the interpretation of these probabilities are given in another paper by the author (8).

While the analysis of the uncorrected vision by race clearly indicated much better vision for the Negro examinees, the probabilities of correctability point curiously in the opposite direction. For instance, for white examinees, the column labeled 20/100 uncorrected vision (table 4) indicates that the probability of having this vision corrected to as high as 20/20 is 0.595; to not better than 20/30, 0.217; to not better than 20/40, 0.092, and so forth. In other words, one may expect that 59.5 percent of the white examinees having 20/100 uncorrected distant vision are likely to have their vision corrected to as high as 20/20; 21.7 percent, to not better than 20/30; and 9.2 percent, to not better than 20/40. Altogether, 90.4 percent of the white examinees with 20/100 uncorrected vision can expect to have their vision corrected to 20/40 or better. The remainder, 9.6 percent, cannot expect to have their 20/100 vision corrected to as high as 20/40.

For Negro examinees, the column labeled 20/100 distant vision shows that 49.0 percent of them may be expected to have their vision corrected to as high as 20/20; 20.5 percent, to not better than 20/30, and 14.5 percent, to not better than 20/40. Altogether 64.0 percent of the Negro youths with 20/100 uncorrected distant vision may be expected to have their vision corrected to not better than 20/40, a manifestly lower percentage than for white examinees.

Analogous lower probabilities of correctability are indicated for Negro examinees by each column of table 4. As far as could be determined, this finding is not known to the literature. Our data provide no clue as to the cause of these differentials.

### Summary

This study deals with uncorrected and correctable distant vision of Selective Service registrants examined for military service during the 21-month period from January 1957 through September 1958.

The data were abstracted from the medical examination reports (Standard Form 88) of the examinees. It was a sample (50 percent) study comprising some 273,000 reports.

The analysis was carried out by race, involving some 222,000 medical reports of white (denoting non-Negro) examinees, and 51,000 such reports of Negro examinees.

The mean ages (as of last birthday) of these examinees were computed as 21.8 years for the white and 21.6 years for the Negro examinees. Most of the examinees (71 percent of the white and 72 percent of the Negro examinees) were within the 21- to 22-year age group.

Better vision for the Negro than for white examinees was found. For instance, 82 percent of the Negro examinees had 20/20 uncorrected bilateral vision, as compared with 69 percent of the white examinees. On the other hand, the probabilities of correctability of poorer to better vision were lower for the Negro than for the white examinees. For instance, it may be expected that 60 percent of the white youths having uncorrected distant vision of 20/100 could have their vision corrected to as high as 20/20, while the corresponding percentage for the Negro youths is 49. Lower probabilities of correctability were found for the Negro youths in each of the visual readings of 20/40 and lower.

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# Experimental Biology

**D**URING the 44th annual meeting of the Federation of American Societies for Experimental Biology, more than 2,600 papers were presented in a 5-day session at Chicago, April 11-15, 1960. Of this number, a few are mentioned below.

Abstracts of most of the papers were made available before the meeting by the society, which employed an electronic computer to place the papers in order in the book and to compose an index with cross references in 261 categories of the contents. Funds for this experiment were provided by the National Science Foundation.

The computer also scheduled the program to assure a minimum of conflicts, and to take into account the size and location of meeting rooms. It made possible for the first time a plan to define and analyze subjects of greatest interest to members.

## Toxins

Public health measures to deal with environmental wastes, with manmade chemicals, and with the safety of food and water, stated H. F.

Smeyth, Jr., of Mellon Institute, will lean heavily on information developed by disciplined experimental studies by toxicologists.

A special challenge to toxicology mentioned by Dr. Herbert Stokinger of the Public Health Service is posed by environmental poisons which are too inconspicuous to be measured or even to be identified but which nevertheless damage persons chronically exposed. The slow emergence of effects such as cancer, he added, makes it difficult to associate them with the cause. The long-term effects of low doses of radiation were mentioned by Dr. Charles Dunham, Atomic Energy Commission, as another example.

A challenge cited by Dr. A. J. Lehman of the Food and Drug Administration is the abnormal sensitivity of a small fraction of the population to medication which may be suitable for the majority. Animal trials, for the present, he said, give little or no indication of the presence of such a hazard.

A clue to the resistance of some strains of *Staphylococcus aureus* to penicillin was reported by Harry Steinman, Public Health Service, who suggests that the antibiotic stimu-

lates the organism to produce abnormal amounts of penicillinase, which counters penicillin's usual activity.

Undesirable side effects of a few drugs may be prevented or cured with vitamins, according to J. M. McLaughlan and colleagues of the Canadian Food and Drug Laboratory. Following clinical observations made after the drugs had been in use for some years, the laboratory studied the relation of drugs and vitamins in the growth of micro-organisms. McLaughlan reported specifically on a study of an oral medication for diabetics, applied to a protozoan.

The passage of cigarette smoke through the bronchii tends to narrow the ducts and limit the access of air to the lungs, according to measurements by Dr. J. A. Nadel and colleagues, University of California Medical Center. For this study they used a body plethysmograph, an instrument chamber which completely encloses the patient. Ten inhalations of cigarette smoke, they said, reduced air conductance by half. The effect was immediate and lasted an hour.

Chemical processes which counter the toxic effects of alcohol were reported by E. M. Lansford, Jr., University of Texas. Using *Lactobacillus arabinosus* as the experimental culture, the investigators found that growth, inhibited by alcohol, was restored by a hot water extract of beef liver. Active compounds of the extract were a group of ribonucleosides.

### Nutrition

Dental caries in cotton rats appears to be inhibited by adding hulls of rice, peanuts, cottonseeds, and pecans to their diet, according to observations by Kenneth O. Madsen, University of Texas, Houston.

Susceptibility to parasites was linked to malnutrition by Robert G. Yaeger and O. Neal Miller, Tulane University, who found that the quality of protein in the diet of rats influences their reaction to Chagas' disease.

Sarah Hopper and A. E. Axelrod, University of Pittsburgh, reported further studies on the essentiality of vitamins to the production of antibodies to a strain of influenza virus.

Development of fish flour as a low-cost protein dietary supplement was reported by A. B. Morrison and J. A. Campbell, Food and Drug

Laboratory of Canada. Fish flour is especially rich in the essential amino acid, lysine, whereas common cereal flours are not.

Another low-cost diet under investigation, algae, which have been produced in bulk lots by the Japan Nutrition Association, was reported on by M. E. McDowell and colleagues, Army Medical Research and Nutrition Laboratory, Denver. Relatively high in protein, algae supply essential vitamins and amino acids except methionine. Fed to four young adult males, up to 100 grams a day were found tolerable but not enjoyable.

Menthol was reported by T. D. Elder and colleagues of the Public Health Service to have an effect like progesterone on the metabolism of galactose. This discovery, they said, indicates that this may be another rare example of a nonsteroid performing like a hormone. The observation occurred during studies of galactosemia, a relatively rare hereditary disorder of children.

The rise and fall of goiter incidence in Michigan was reviewed by Isidor Greenwald, New York University-Bellevue Medical Center, New York, who is skeptical of the widely held belief that goiter has been arrested or reduced by the use of iodized salt, or that goiter results from iodine deficiency.

A study by Karl Habel, Public Health Service, indicates that tumors incited in a newborn hamster by polyoma virus may grow after transplantation to an adult hamster in the absence of the virus. At least attempts to find the virus in a transplanted tumor failed. On the other hand, a tumor incited in a mouse yielded virus consistently in one series of 10 transplants.

The mystery of recrudescence of infections which follow treatment of acute disease with antibiotics is being studied by the Public Health Service by use of tissue cultures. A report by H. E. Hopps, J. L. Showace, and J. E. Smadel, all of the Public Health Service, suggests that while bacteria, rickettsiae, and the largest viruses are in general sensitive to specific antibiotics, certain organisms appear to lodge between the cells of the tissues in a position where they are protected from the action of the drug. Past experience has demonstrated that such organisms are appreciably less resistant in a test tube culture than in a tissue culture.

Physical fitness appears to be the best protection against true exposure to cold, according to experiments conducted by Earl J. Heberling and Thomas Adams, working through the Arctic Aeromedical Laboratories in Fairbanks, Alaska.

Irradiation of beef to preserve it appears to destroy vitamin K, according to B. Connor Johnson and colleagues who conducted a dietary study at the University of Illinois.

### Heart Disease

The present state of knowledge of heart disease, in the opinion of Broda O. Barnes and Max Ratzenhofer, Pathological Institute, University of Graz, Austria, is akin to the position on diabetes, shortly before the cause and treatment were established. It is now possible, they said, to measure blood cholesterol, even as blood sugar is measured for diabetes. And Dr. Barnes believes the thyroid hormone will reduce cholesterol levels even as insulin reduces sugar. She believes she has successfully treated patients for 10 years by that method.

Since the liver manufactures 20 times as much cholesterol as appears in the diet, the authors see no benefit in reducing cholesterol intake.

Autopsies performed or reviewed by the authors are said to discredit theories that women are protected from heart disease by the men-

strual cycle, that heart attacks are a consequence of severe stress, and that fat rather than protein is the main dietary factor in the incidence. Also, they state that their experiments indicate the amount of protein in the diet, rather than fat, is the principle contributing factor to a high level of cholesterol in the blood.

By tracing radioactive fats, Donald Berkowitz and colleagues at Hahnemann Medical College, Philadelphia, found indications that fat tolerance rather than cholesterol is critical to the prevention and control of atherosclerosis.

Another oil which lowers the level of cholesterol in the blood has been developed in highly concentrated form by Martin Nothman and Samuel Proger of the Pratt Clinic New England Center Hospital, Boston. Known as arachidonic acid, it appears to be more effective than linoleic acid or linolenic acid, though difficult to produce.

A relatively common source of unsaturated fat, the avocado, was used by Wilson C. Grant, Veterans Administration Hospital, Coral Gables, Fla., experimentally to reduce serum cholesterol, with significant results in one-half the patients observed.

Association of a microbe of the order Actinomycetales with destruction of elasticity of arterial walls was reported by Anthony J. Sbarra and colleagues of St. Margaret's Hospital, Tufts University Medical School, Boston.

### WHO Fellowships for U.S. Citizens

February 1, 1961, is the deadline for a limited number of short-term fellowships in public health and allied fields, to be awarded by the World Health Organization to full-time public health and educational workers from the United States.

Applications are submitted to the WHO Fellowship Selection Committee set up in 1959 by Surgeon General Burney. One criterion for selection will be the importance of the individual's contribution on his return, attributable to the foreign study. Employees of the United States Government are not eligible.

The fellowships cover per diem and transportation and ordinarily are limited to short-term travel, for 2 to 4 months. Employers are expected to endorse applications and continue salaries during the fellowships. Successful applicants probably can not start their fellowships before May 1, 1961.

Further information and application forms are available from Dr. Howard M. Kline, Secretary, World Health Organization Fellowship Selection Committee, Public Health Service, Washington 25, D.C.



## Spotlight on Rescue Breathing

The educational program in rescue breathing conducted by the Erie County (N.Y.) Health Department demonstrates how an opportunity for leadership may be developed in a single aspect of a well-rounded campaign.

In its broad accident prevention program, the county health department had decided to concentrate on a few selected problems. Subsequently, a special advisory committee to the commissioner, mindful of the county's geographic position, pinpointed water safety for emphasis. Further consideration focused interest on lifesaving techniques, specifically the relatively new method of rescue breathing.

Most medical and safety groups had endorsed the method, and medical journals had given it attention for several years, but popular knowledge and acceptance were relatively meager. The Erie County Health Department decided that it had the responsibility of promoting this method of artificial respiration.

At that time, much of the research on the method was being carried out at the Roswell Park Memorial Institute. Parallel local efforts included the setting up by the county medical society of a special subcommittee on rescue breathing that reached professional and special interest groups. An extensive program for the city and county high schools was also underway. Consequently, the health department's main responsibility in the program was to reach the general public.

An exhibit was designed and constructed by the department's office of public health education, mainly to delineate the mouth-to-mouth or mouth-to-nose technique of rescue breathing. Entitled "Your Breath Can Save a Life," one element of the exhibit depicts the essentials of rescue breathing through use of flashing colored transparencies. Another panel lists the advantages of this method and the authoritative groups endorsing it. Two life-sized mannequin heads, in a shadowbox, move in synchronized rhythm to depict the rescuer and

victim. Schematic drawings with detailed instructions supplement other literature, including a wallet-sized card on which the method is outlined (see the January 1960 issue of *Public Health Reports*, p. 45). Personnel of the health department were trained to demonstrate the technique and to man the exhibit.

The exhibit was put on public display first in August 1959 at the Erie County Fair. Most of the 30,000 fairgoers who passed through the health building stopped long enough to watch the entire demonstration and ask questions. In addition, many requested programs for their organizations. Next, the exhibit appeared in the lobby of Buffalo's City Hall, where again interest was high.

At the October 1959 meeting of the American Public Health Association, the exhibit was awarded a certificate of merit from the association's scientific health committee. A continuous circuit at advantageous locations is planned.

Concurrently, other activities were undertaken to round out the project. Several television programs with live demonstrations have been arranged and special news releases are issued continually. A training film, "Rescue Breathing," which was purchased by the department, is shown together with a demonstration to any interested group. Also, inservice training sessions are held for all department personnel. Future efforts will be directed toward intensifying current activities.

No formal evaluation is contemplated to determine the extent of the program's effectiveness, but, based on close observation, certain conclusions seem valid. Rescue breathing as a lifesaving technique concerns and interests a broad section of the public. Even casual viewers can be given adequate instruction once their attention is captured and qualified attendants are present to clarify pictorial explanations.—  
RITA R. CHAZAN, M.P.H., director, office of public health education, Erie County Health Department, Buffalo, N.Y.

# Health Problems of the Navajos in Monument Valley, Utah

FRANK R. LEMON, M.D.

A SURVEY of the health status and some of the needs of the Navajos in Monument Valley, Utah, was initiated in 1956 by the department of preventive medicine, College of Medical Evangelists, and has continued intermittently until the present time. The Monument Valley Mission Clinic was headquarters for a preliminary investigation from 1956 through 1958, and the findings of that investigation are the subject of this report.

The objectives of the study were, first, to gather information relative to the age and sex distribution of the local population; second, to identify a few of the larger health problems; third, to obtain some concept of the rate of pregnancy and the degrees of childhood mortality; and fourth, to measure the reaction to tuberculin, histoplasmin, and coccidioidin.

The survey was conducted in three phases: (a) collection of demographic and illness data; (b) test inoculations with tuberculin, coccidioidin, and histoplasmin, and X-ray screening of a random sample of the population; and (c) reinoculation with coccidioidin and followup chest X-rays of those previously screened.

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*Dr. Lemon is associate professor of preventive medicine, School of Medicine, College of Medical Evangelists, Loma Linda and Los Angeles, Calif. This study was supported in part by the National Foundation through student fellowship grants to Alan King, Keith Mack, Donald Weaver, and John Ruffing, who collected many of the data.*

*Personnel of the Monument Valley Mission Clinic, including Dr. Paul Bringle, Dr. Lloyd Mason, and Mrs. Gwendolyn Walter, R.N., assisted in the field-work and provided valuable liaison with the Navajos and their leaders.*

The field studies were made during the summer months, June through September, of 1956, 1957, and 1958. This season is more suitable for travel by jeep, and most of the children are home from boarding school in the summer.

During the study, 1,140 individuals were identified in the families studied. Of these, 54 had had illnesses or injuries resulting in hospitalization during the previous year. One-fourth of these admissions were for tuberculosis. This does not include an undetermined number who died from illness or injury prior to hospitalization.

## Study Area

The Navajo reservation occupies approximately 25,000 square miles in the northeast corner of Arizona and portions of two adjacent States. An estimated 75,000 Navajos lived on the reservation in 1958 (1a). Traditionally, the sustenance of the Navajos has been obtained from sheep raising and summer gardening, chiefly corn, in the scattered valleys, where some water is available. The economic status of the tribe has recently been elevated and their pattern of living changed somewhat by the development of oil, uranium, and other mineral deposits on the reservation. However, in many areas, they continue the nomadic life of past centuries (2, 3).

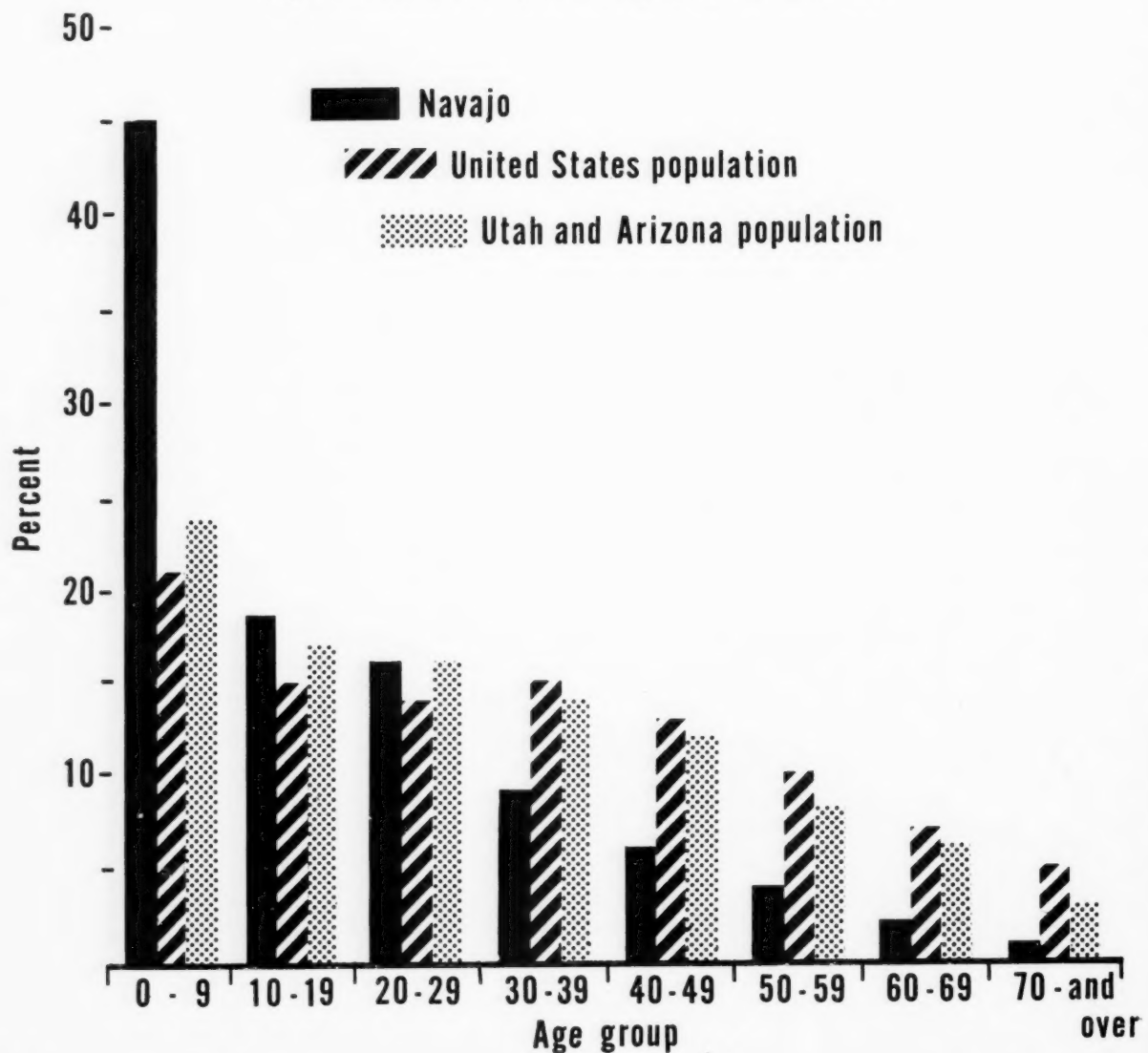
Monument Valley is 55 to 60 miles west of the "four corners" junction of the State borders of Utah, Arizona, Colorado, and New Mexico. The area of the present study is centered where Utah State Highway 47 crosses the Utah-Arizona border and extends about 15 miles south and 25 miles in other directions, encom-

passing about 1,800 square miles. The region is characteristic of the southwestern "high desert" country. The altitude is approximately 5,200 feet. The terrain is marked by dramatically shaped and colored vertical red-rock "monuments" interspersed with arid, sage-covered range land. The valley is one of the more remote and primitive areas of the Navajo reservation, being separated by 100 miles of rough dirt road from the Government hospital at Tuba City, Ariz., and, during the study, by 72 miles of similar road from the town of Blanding, Utah. Distances to other major points south and east are greater, and much of the region is seldom-traversed wilderness.

In 1956 the Navajo population of this region was estimated at between 1,500 and 1,800 individuals, living in small family groups. A few were concentrated at various points near mines, ore-processing plants, or the two trading posts at Monument Valley and nearby Oljato. There was a small immigration of families into the area during 1956 and 1957.

Vital statistics pertaining to the Navajos are difficult to obtain. Their dispersed way of existence, the frequency with which they change their names or use several names, the occasional practice of polygamy, and the inconsistent reporting of births and deaths have combined with language and cultural barriers to obscure the

Age distribution of 1,140 Navajos, by decade, 1957





census and the measurement of health problems. Some estimates have indicated a population of low average age compared with the population of the United States (1, 2); others have indicated birth rates and childhood death rates of three to four times the national average (4). Tuberculosis is a major problem. Pneumonia, gastroenteritis, and other infections, including trachoma, are the principal causes of morbidity and mortality, along with accidents (4-7). With present knowledge, all of these diseases are largely preventable.

### Collection of Data

In 1956, assisted by interpreters, the investigators extended partial enumeration of Navajos from the vicinity of the clinic to progressively more distant perimeters. Data were collected in each family on the age, sex, and occupation of each member. Women of childbearing age were identified, as were members of the family who had died during the past year or who had suffered an illness or injury requiring hospitalization. More detailed inquiry was made of those persons reported to have such illnesses, injuries, or pregnancies. At the same time, clinic and hogan visits were tabulated to give an index of clinical problems. Of 468 consecutive visits, 178, or 38 percent, were pediatric in nature; 173, or 37 percent, general medical; and 55, or 12 percent, for routine dental complaints. The remainder involved both routine and emergency surgical and obstetrical care. The preponderance of general medical and pediatric contacts indicates an opportunity for health education and preventive medicine.

### Age and Sex Distribution

The age distribution of the 1,140 Navajos identified is notable when compared with the populations of the entire United States, or the States of Arizona and Utah (see chart), or the total Navajo population. Seven hundred and twenty-one (63 percent) were under 20 years of age. This age group was estimated at 57 percent of the total Navajo population in 1950 (1a). The marked shift toward the younger ages is represented by the extremes. Children aged 0-9 years comprised 45 percent of the Navajo population in the study area, or an esti-

mated 34.6 percent of the total Navajo population in 1957 (1b), compared with 21 percent in the United States as a whole and 24 percent in the Arizona-Utah population. Those 50 years of age and older comprised only 6 percent of this Navajo group in contrast to 22 percent in the United States and 17 percent in the Arizona-Utah population.

The sex distribution of the study group was 574 male and 566 female, of whom 419 (37 percent) were 20 years of age or older. There were 20 married women under age 20.

Of 234 employed or employable men in the families studied, 78 percent were engaged in mining, sheepherding, and construction, 4.7 percent were storekeepers or medicine men or were retired, and 17.3 percent were engaged in miscellaneous occupations.

### Pregnancy and Childhood Mortality

Information provided by 175 Navajo mothers in the childbearing ages 17-49 years revealed a high pregnancy rate. Of these mothers, 142, or 81 percent, reported a pregnancy on an average of at least every 2 years (table 1). More than one-third averaged a pregnancy yearly. An annual pregnancy was common up to age 29, and an average of one pregnancy at least every 2 years up to age 39. Fifty-five percent had had five or more pregnancies; nearly one-third, more than seven. These women reported 857 live births and 38 pregnancies ending in fetal death, a ratio of 22.6 to 1. In the continental United States in 1957, the ratio of registered live births to fetal deaths was 45.9 to 1 (8, 9).

We believe that among the Navajos there was a cultural reticence to report, and probably a failure to recall, stillbirths or abortions. We know of no exactly comparable data concerning the average frequency of pregnancies among women of the United States. A report on child spacing published in 1958 (10) indicated that among a group of 66,930 women in the United States aged 15-44 years, there were 26,438 (39.5 percent) of various or no parity whose marriage or last live birth had been within a 2-year interval. Twenty-two percent of these had a live birth within that 2-year interval; 17 percent had a live birth within 1 year after marriage or after a previous birth.

The frequency of childhood mortality is indicated by the report of 73 of 175 mothers that they had lost one or more children after birth (table 2). The most common causes of death, on the basis of descriptive information provided by clinic records or by the parents, were respiratory, gastrointestinal, and central nervous system infections, and injury.

Of 146 childhood deaths among 857 live births from 1927 to 1956, 108 occurred during infancy (table 2). A crude comparison of the death rate among Navajo infants with the United States infant death rate is made on the basis of these 108 deaths. Of all newborns reported by mothers in the study group, 12.6 percent died during infancy. This represents an average infant death rate for each of these 30 years which may have been more or less than 126 per 1,000.

The decline in infant mortality in the United States during the period 1927-56 was virtually a straight-line fall (11, fig. 1). Therefore, it is possible to estimate an average rate for this period which is nearly a correct summation for the entire 30 years' experience. At the midpoint of this period the infant mortality rate in the United States was between 40.4 in 1942 and 45.3 in 1941 (12), an average of about 42 per 1,000, or 4.2 percent of all newborns. Thus, infant mortality reported by these Navajo mothers during the period 1927-56 appears to be about three times the rate for the United States.

The data on pregnancy and childhood mortality among the Navajos suggest, in a population that is young compared with the

**Table 2. Deaths among offspring <sup>1</sup> of 73 of 175 Navajo mothers in Monument Valley, Utah, 1927-56, by age group**

Age at death (years)	Number	Percent	Common causes of death
0-1-----	108	74	Respiratory, gastrointestinal, meningal, and secondary infections following childhood diseases. Injuries.
Died before 1950.	68	47	
Died 1950 and after.	40	27	
2-9-----	32	22	
10 and over-----	6	4	Injuries.
Total----	146	100	

<sup>1</sup> Majority born since 1930.

surrounding white population, a probable high birth rate, with an associated high rate of infant and childhood mortality. The data are insufficient, however, to give current birth and infant death rates precisely. It was our impression that, with the increased availability and use of health services in the area since 1950, there has been a decline in infant mortality.

#### Inoculations and X-rays

During 1956 and 1957 nearly 1,000 individuals were tested for their reactions to one or more intermediate strength tuberculin, histoplasmin, and coccidioidin (tables 3 and 4).

In 1956, intermediate strength tuberculin was administered intradermally to a random selection of Navajos aged 29 and under. In 1957, additional test inoculations with tuberculin,

**Table 1. Pregnancy experience of 175 Navajo mothers <sup>1</sup> aged 17-49 years, Monument Valley, Utah**

Average interval between pregnancies (years)	Total		Age group (years)							
			15-19		20-29		30-39		40-49	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1-----	65	37.0	12	19.0	47	72.0	4	6.0	2	3.0
2-----	77	44.0	1	1.0	32	42.0	35	45.0	9	12.0
3-----	17	10.0	0	0	4	24.0	4	24.0	9	52.0
4 or more-----	16	9.0	0	0	3	19.0	7	43.0	6	38.0
Total-----	175	100.0	13	7.4	86	49.1	50	28.6	26	14.9

<sup>1</sup> Based on 175 "married" women ages 17-49 in hogans and camps surveyed.

**Table 3. Reactions to 378 histoplasmin and 492 coccidioidin skin tests among Navajo Indians in Monument Valley, Utah, by age group, 1957**

Age (years)	Antigen			
	Histoplasmin <sup>1</sup>		Coccidioidin <sup>2</sup>	
	Positive	Negative	Positive	Negative
0-19-----	2	232	11	312
20 and over----	3	121	9	145
Unknown-----	0	20	3	12
Total-----	5	373	23	469

<sup>1</sup> Equivalent to NIH reference histoplasmin.

<sup>2</sup> Cutter 1:1,000 dilution, biologically standardized.

coccidioidin, and histoplasmin were performed among a random sample of the total study population. At the same time, this sample was subjected to a screening X-ray of the chest, usually provided by a mobile unit of the Public Health Service, with technical and consultative assistance from officers of the Service's Division of Indian Health. Radiographs were read by Dr. Paul Deeb, department of radiology, School of Medicine, College of Medical Evangelists. Of those variously skin tested, 32 had abnormal pulmonary findings (table 5), and of these 27 were tuberculin positive, 2 were coccidioidin positive, and none of 15 was his-

toplasmin reactive. These data suggest that persistent inflammatory, calcified, or fibrotic lesions of the lungs in Navajos in this area are most likely due to tubercular infection. However, the possibility of endemic coccidioidomycosis is suggested.

Of the 967 persons tuberculin tested in 1957, 229, or 23.7 percent, reacted positively (table 4). It is surprising to find only 8.2 percent positive among children 14 years of age and under. Other investigators have reported as high as 22 to 33 percent positive reactions up to age 12 in other areas of the reservation (R. R. Omran, at the 1958 meeting of the American Public Health Association, and personal communication from Dr. Kurt Dueschle). In April 1959, when 32 Navajo preschool and elementary school children aged 6-14 years were tested with tuberculin at Mexican Hat, Utah, at the northern perimeter of the Monument Valley study area, 2 reacted positively (personal communication from Dr. Lloyd Mason, July 1959).

Of the 967 persons tested with tuberculin, 158 were tested in both years, and of these 6 had converted to positive in the interval. In 1957, two of the 6 "converters" had an X-ray report of a suspicious inflammatory lesion of the lungs. Five of 378 persons tested with histoplasmin were positive (table 3), and of these none revealed any significant findings on chest X-ray. They may have been "false positives" following administration of antibiotics (13). Twenty-

**Table 4. Results of tuberculin tests <sup>1</sup> on 967 Navajos in Monument Valley, Utah, 1956 and 1957**

Age group (years)	Total tested	Reaction				
		Positive			Negative	
		Number	Percent	Cumulative percent	Number	Percent
0-4-----	301	6	2.0	2.0	295	98.0
5-9-----	252	23	9.1	5.2	229	90.9
10-14-----	130	27	20.8	8.2	103	79.2
15-19-----	81	31	38.3	11.4	50	61.7
20-29-----	76	49	64.5	16.2	27	35.5
30-49-----	61	46	75.4	20.2	15	24.6
50 and over----	47	41	87.2	23.5	6	12.8
Unknown-----	19	6	31.6	23.7	13	68.4
Total-----	967	229	23.7	23.7	738	76.3

<sup>1</sup> Parke-Davis P.P.D. 0.0001 mg. in 0.1 ml.



**Table 5. Skin test reaction of 32 of 44 Navajos with positive chest X-rays, Monument Valley, Utah, 1957**

X-ray diagnosis	Number X-rayed	Number skin tested	Reaction					
			Tuberculin		Histoplasmin <sup>1</sup>		Coccidioidin <sup>1</sup>	
			Positive	Negative	Positive	Negative	Positive	Negative
Acute lesion.....	6	4	2	2	0	3	0	4
Calcified pulmonary lesion.....	17	10	8	2	0	3	1	8
Calcified secondary lesion.....	12	10	10	0	0	8	0	7
Fibrosis.....	9	8	7	1	0	1	1	7
Total.....	44	32	27	5	0	15	2	26

<sup>1</sup> Histoplasmin and coccidioidin tests were not done on all 32 patients who were tested with tuberculin.

three of 492 persons tested with coccidioidin were positive; half of them under 20 years of age (table 3). Of these 23 individuals, 2 had suspicious X-ray findings. These were suggestive of a calcified "primary" lesion of the lung in one instance and of "fibrosis" of a portion of the lung field in the other. Of the 11 coccidioidin positive reactors under 20 years of age, 2 had been off the reservation in nearby areas of Arizona and New Mexico. Three had regularly lived farther than 50 miles south of Monument Valley. Six were local residents.

#### X-ray Followup

In 1958, a followup chest X-ray was made on 36 of 44 individuals whose 1957 X-rays had suggested acute or chronic inflammatory chest lesions. Two of these were reported to have "probable active pulmonary inflammatory disease"; four were suspected of having other intrathoracic pathology. One individual was located in a tuberculosis sanitarium, and two were reported as deceased, cause unknown. Twenty-seven were found to have no significant lesion on reexamination.

#### Discussion

The Navajo way of life is in many ways foreign to life outside the reservation. Health practices and attitudes continue to be influenced by ancient cultural concepts, although some of these concepts are modified as the Navajo is

regularly exposed to the "white man's medicine" and to his ideas of hygiene and sanitation. On the reservation, considerable variation in morbidity and mortality experience probably exists between different areas with differing availability of health services.

The pattern of a predominantly young population, exhibiting evidence of a high birth rate and a high infant death rate appears to be true in Monument Valley as other investigators have estimated it to be in other areas of the Navajo reservation. However, the difficulty of obtaining precise data inhibits broad interpretation of our findings.

Because of their way of life, insanitary practices, and the distances to medical facilities, it is not surprising that morbidity and mortality from infectious diseases continue to be major problems among the Navajos. The challenge to health workers is to seek correction of those factors which predispose these people to preventable disease.

Although tuberculosis may be a special problem for the Navajo on a racial basis, it would be of interest to compare data concerning this infection among those living on the reservation with similar data for those living in the environmental conditions and by the standards of the surrounding white population.

#### Summary

The somewhat isolated group of Navajos in the Monument Valley area of Utah is made up

of a predominantly young population with an apparently high birth rate and a high childhood death rate. Major disease problems of the area include tuberculosis and other respiratory, gastroenteric, and miscellaneous infections. Of 967 individuals tuberculin tested, 229 were found to be positive, whereas of 378 tested with histoplasmin, only 5 were positive, and of 492 tested with coccidioidin, only 23 were found positive. It is believed that a crude baseline for the health status of Navajos in the region has been ascertained. Further study is contemplated to define more precisely the nature of these and other health problems.

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# Training Health Administrators

ROBERT J. MOWITZ, Ph.D.

**S**HORTLY after World War II, leaders in the National Tuberculosis Association reviewed current and future personnel needs and came to the conclusion that within a few years many key executives in State and local affiliates would soon be lost because of death or retirement. This inventory led to the conclusion that, in order to avoid a crisis resulting from a shortage of professionally trained personnel for executive positions, it would be necessary to take some positive steps. The steps taken culminated in the establishment of a graduate training program in health administration at Wayne State University, Detroit, Mich.

There was much discussion in public health circles during this period concerning the proper role and training of nonmedical administrators. The need for such personnel was well recognized, but the role to be played, especially in official health agencies, was vague. Formal training, with the exception of hospital administrator programs, had not as yet been institutionalized. This state of affairs was revealed in the "Proposed Report on Educational and Experience Qualifications of Administrative Personnel (Non-Medical) in Public Health Agencies" that appeared in the *American Journal of Public Health* in April 1951. The report asserted that: "The basic preparation of a non-

medical administrator in public health agencies should give him an awareness of the social setting and biological basis of health work and training in the role and organization of administration." This generalization is a succinct statement of the general policy followed some 3 years earlier in organizing the Wayne program.

Since the position of executive secretary in a voluntary health agency had traditionally been held by a lay person and since no particular professional group had ever dominated these positions, it was possible to design a training program for potential executive secretaries with a remarkable degree of freedom. The committee which met in Detroit in the fall of 1948 to consider such a design included among its members two medical health officers, a professor of health education from a school of public health, and personnel from NTA and the university. The committee's decision to develop a curriculum combining training in the art and science of administration with substantive training in health was later echoed in a report of a committee of the American Public Health Association. Within this general framework, the committee further decided that the responsibilities of the positions to be filled required a degree of maturity and sophistication that could only be achieved through graduate training; that the core of the curriculum should be training in administration, with the health content provided, for the most part, through the use of outstanding public health practitioners and teachers as guest lecturers and through field training; that the principal criteria for admission should be a sincere interest in serving the public and a demonstrated capacity to do quality graduate work; and that fellowships should be offered in order to attract the best possible candidates.

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*Dr. Mowitz is professor of political science, Wayne State University, Detroit, Mich. The National Tuberculosis Association supplied basic financial support for the 9 years' experience in training public health administrators described, through annual grants to the university and the establishment of a number of fellowships each year. Fellowships have been provided also by the National Society for Crippled Children and Adults and the American Cancer Society.*



Using the guidelines developed by the committee, the details were worked out, and with the support of NTA, the program got underway with two students in January 1949. In September 1949, it was established as a full-time 12-month program, including two semesters of course work and a summer of field training, and eight additional students were enrolled. By September 1958, 58 fellowship students had completed the training. Since this has been a rather unique experiment in training for the health profession, a brief review of the past 9 years' experience should be of interest.

One characteristic of the Wayne program that seems to result in an occasional raised eyebrow in public health circles is its location as part of a public administration curriculum. This may be due in part to a misconception of the public administration discipline. Or in part it may be due to a feeling that all training for public health positions should be confined to schools of public health, a position avoided in the APHA report referred to above but still in existence and detectable to even the casual observer. To argue the point is not the purpose of this article. But it is appropriate to point out that the public administration discipline is reaching a point of development wherein training in its art and science is rapidly becoming indispensable to anyone holding a position of responsibility in any organization claiming to serve the public interest. Errors that at an earlier time could be excused as the necessary cost of a trial-and-error approach to administration become inexcusable with the availability of knowledge and skills to avoid such errors. It would seem to make sense, then, to use the content of public administration as a base upon which to build the health administrator's training. Certainly in 1948 it seemed to be worth a try, and it was appropriate for a voluntary agency with a tradition for experimentation to spur the effort.

#### **Program Format**

A curriculum problem during the past 9 years has been to keep abreast of the dynamic changes occurring in both the health and public administration fields. Social science research is producing findings that provide the basic input of

facts with which the student of administration must deal. These include the psychologists' findings in relation to motivation, perception, and learning on the one hand and, on the other hand, experimentation in the use of mathematical models to solve program problems through the use of operations research techniques. A current course in the curriculum deals with the relationship of a bureaucracy to the policymaking process in a pluralistic power system. This course was not part of the curriculum 9 years ago. In addition there are courses in group dynamics and discussion and conference techniques.

But seminars have been the principal vehicle for keeping public administration subject matter abreast with current knowledge. It seems necessary to emphasize this point since it appears many still have the notion that the discipline of administration is confined to the study of formal organizational structure and administrative procedures. (The standard texts in "public health administration" tend to give this impression.) The point being made here is that the dimensions of the discipline increase as our knowledge about behavior in complex organizations and systems of organizations increases.

It is not necessary to elaborate on the changes in the health field during the past few years. For the most part, guest lecturers covered this part of the curriculum. During the past 9 years, well over 100 different speakers have participated. The large number is due in part to the shifting emphasis in public health problems in recent years and the need to bring in different specialists to deal with these subjects. At the same time it has been the policy to supply a wide variety of professional points of view in order to avoid a stereotyped approach to a dynamic area of study.

A core of eight guest lecturers participate each year, and it is around this core that the other lectures are scheduled. Although the temptation to engage in name dropping is almost irresistible at this point, suffice it to say that the lecturers are recruited from official health agencies (Federal, State, and local), schools of public health, colleges of medicine, voluntary health associations, and research foundations, to name only the major sources. Those who have participated in the guest lec-

ture system, either as teacher or student, know the difficulties involved in its use, but its justification lies in its ability to bring to a class a variety of skills and talent that cannot be duplicated on a single campus. The core eight who appear annually are strategically spaced throughout the year, and their familiarity with the program assists the course director in integrating the various lectures. Experience here would indicate that it takes at least 3 years to "shakedown" a guest lecture program into an effective teaching device and, of course, constant attention thereafter. Supplementing the guest lectures is concurrent and summer field training with official and voluntary agencies.

### Student Characteristics

The 58 fellowship students received their undergraduate degrees from 38 different colleges and universities distributed geographically in all sections of the United States. Most had undergraduate majors in one of the social sciences, with political science, sociology, and public administration the predominant fields. Three had majored in one of the physical sciences and one student had been in business administration. Although no particular undergraduate major has been required as a condition of admission, the organization of the program in conjunction with the public administration curriculum seems to have attracted the social science major. Experience has shown that there is no one best major, and there are decided advantages in having a group of students with a variety of undergraduate backgrounds.

Six students had had prior experience in voluntary health associations, and two left positions with official agencies to accept fellowships. For the remaining 50, the training was their first exposure to public health. Most of this group had been motivated to apply for the fellowship as a result of the advice of a faculty adviser, but a few had been self-motivated after reading printed material. The college professor has been the most effective recruiter for this program.

In comparing the performance of students who have had prior experience in public health work with those who have not, it would be diffi-

cult to make a good case for a program that would exclude either one of these categories. Certainly the student with experience contributes a good deal to his inexperienced colleagues, but the student fresh out of college has usually developed the good study habits and concern for scholarly detail in fulfilling assignments that help keep the training at that level of sophistication commensurate with graduate study. In addition, there is the virtue of introducing new blood into the field through recruiting the college graduate directly into professional training.

All but five of the students have been men, all but six of whom had some prior military service. The only significance of this latter fact is that it indicates that most of the men were in their middle twenties and, having fulfilled their military obligations, were able to accept a full-time position at the completion of their training.

### Placements

One of the issues discussed by the planning committee in 1948 involved the possibility that students with sound training as administrative generalists would desert the health field. If transferable skills were to be taught, why couldn't they be transferred to any other field? It was felt that this was a risk worth taking, but the ghost of this issue continues to haunt this and other health training programs. The insistence by many that public health experience should precede postgraduate training is another manifestation of this compulsion to prevent personnel from escaping the field. There are obvious reasons for this point of view. Subsidized training, whether in the form of fellowships or other means, is expensive, and, too, there are the strong feelings of those who are sincerely committed to a particular field of endeavor and who have a tendency to question the motives of those who do not share their zeal.

On sober reflection, however, most would agree that in a free society it is the challenging nature of the position and the opportunity it provides to maximize values considered important to that society that will determine the outcome in the competition for personnel. It would be a disservice to society to erect barriers that would hold a person in a position demand-

ing only a portion of his talents and energy, to say nothing of the effect it would have on the individual so held. With these considerations in mind, it is of interest to review what has happened to the students after completing training.

Thirty-six graduates, a little more than 60 percent, are working in the health field. The majority of this group, 31, are employed by voluntary health agencies. Affiliates of the National Tuberculosis Association lead the list of employers, followed by the American Cancer Society. Also included among the employing agencies are affiliates of the American Heart Association, the National Society for Crippled Children and Adults, the Mental Health Association, and local health councils. The following indicates the types of positions held.

<i>Position</i>	<i>Number</i>
Executive secretary of State organization----	6
Executive secretary of local organization----	7
Member of national staff-----	3
Member of State staff-----	8
Member of local staff-----	7

The State and local staff positions include administrative assistant to the executive secretary, program director, field consultant, public relations director, and the like.

Of the remaining five who were counted as working in the health field, four are hospital administrators and the fifth is completing work leading to the degree of doctor of medicine. Two of the hospital administrators took additional academic training in hospital administration after leaving Wayne, but the other two did not. An applicant primarily interested in hospital administration is urged to apply to one of the schools with such a formal program, since Wayne is not designed for that purpose. But as can be seen, this does not prevent graduates from becoming hospital administrators, if they are so determined.

Of the 22 who are not working in the health field, 13 had been employed for a year or more in a health agency before leaving for other employment. This leaves 9 out of 58 who did not spend at least a year in the health field. Of the nine, three entered the armed services directly after their academic training, two accepted positions in the Federal civil service, three were employed by private business or in-

dustry, and one became a school teacher. A breakdown of the current positions held by this group of 22 shows 7 in private business or industry, 5 in public service (this includes 1 Marine career officer and 1 State legislator), 4 teachers (including 1 college instructor), 2 attending graduate school, 2 housewives, and 2 unknown.

In reviewing these data, it is interesting to note that none of the graduates is employed by official health agencies. During the initial discussions and on numerous subsequent occasions, health officers have commented that this program provides a type of training for which there is great demand among official health agencies. Former students have reported offers of positions in official agencies, but those who have remained in public health have remained with the voluntary agencies. The responsibility and prestige of those positions held with the voluntary agencies may be the reason. The opportunities for advancement and career development have been excellent for those willing and able to take advantage of them.

In addition to the fellowship students, six employees of official health agencies have been enrolled part time. Four completed the course requirements, and two are now enrolled. Two of these students are employed by a county health department and four by the Michigan Department of Health. All but one now hold positions of administrative responsibility, and their academic backgrounds vary from veterinary medicine to engineering. Although this is too small a group on which to base large conclusions, all have stated that the training was well worth the extraordinary effort required to keep up with both their jobs and academic responsibilities.

### **Conclusion**

An experimental graduate program for training health administrators will soon begin its 10th year of operation at Wayne State University. Sixty percent of its 58 graduates are now engaged in some variety of health work, most with voluntary health agencies. Curiously enough, 6 of the first 10 students now hold executive positions with health agencies, the same percentage as for the entire group. These data



indicate that the training has equipped the students for the type of responsibilities envisaged in the design of the program. This is not to imply that what has been described here is presented as a model for all comparable training.

On the contrary, the continuing critical shortage of qualified administrative personnel should encourage experimentation and improvement of current working models and at the same time stimulate the development of new models.

## **Legal note . . . Sanitation: Sewer Rental Charges**

Municipality's sewer rental charge based solely on amount of water intake held arbitrary where it refused to accept industrial waste from plant which discharged 95 percent of its intake into its own waste treatment plant or directly into a creek. Court required rental to be based on discharge into sewer system. *Borough of North East v. A Piece of Land, etc.* (159 A. 2d 528, Pa., April 1960).

In accordance with an ordinance of the Borough of North East, Pa., providing that the total annual sewer rental was to be equal to the total operating costs and be "equitably apportioned" among sewer users in proportion to the amount of water purchased from the Borough, the sewer rental charge was fixed at 20 percent of the water charge.

The Welch Grape Juice Company, Inc. (owner of the land against which the Borough was seeking to enforce a lien for sewer rental charges) purchases a considerable amount of water, 95 percent of which is used in its plant and ultimately discharged into its own treatment basin or directly into a creek. The company, having been refused permission by the Borough to discharge industrial waste into the sewer system, discharges into the Borough sewer system only the waste from its restrooms, cafeteria, and shower and drinking facilities, which constitutes about 5 percent of the water purchased. Other industrial plants in the Borough engaged in processing similar to defendant are, however, permitted to discharge their industrial waste into the system and are charged the standard rate. Welch was charged a sewer rental based on its total water purchases, which amount it refused to pay. When the municipality attempted to foreclose a lien for unpaid rentals, Welch challenged the charges as unreasonably disproportionate to the service rendered. The Borough contended that defendant should pay a sewer rental based on 20 percent of the total amount of water consumed, regardless of the use of the sewer system.

The Supreme Court of Pennsylvania, ruling

against the Borough, stated that in the construction, operation, and maintenance of a sewer system, a municipality engages in a proprietary function and is entitled to receive payment for the service rendered. The charge that is made for sewer service, however, must be based upon actual use, and must be reasonably proportional to the service rendered and not in excess of it. The court noted that the practical problem of determining the amount of use of the system by particular users has usually been resolved by relating the sewer charge to the amount of water provided to the property, which is apt to be roughly proportional to what flows out as sewage.

The court commented that if the Borough's contention were upheld—that the sewer rental charge is not related to sewer use—the charge would be in the nature of a tax rather than for service rendered, and it pointed out that sewer rentals were not taxes. The Borough's method of computing the sewage charge based upon total water consumption regardless of sewer use was held to result in an arbitrary, improper, inequitable, and unlawful charge, as was demonstrated by the fact that, while it refuses to accept industrial waste from Welch, it accepts the industrial waste of other industries, doing the same type of processing as Welch, at the standard rate. The court affirmed a lower court order fixing the charge on the basis of the amount of water which was reasonably found to have been discharged into the sewer system (5 percent of the intake).—SIDNEY EDELMAN, assistant chief, Public Health Division, Office of General Counsel, Department of Health, Education, and Welfare.

## IDENTIFICATION OF STAPHYLOCOCCUS AUREUS

### IN A FOOD POISONING INCIDENT

William Prince, M.D.

Gilman K. Crowell, M.S.

ON FEBRUARY 15, 1959, a sudden, brief episode of acute gastroenteritis followed a winter carnival banquet served to approximately 180 persons representing the faculty, students, and guests of a private New Hampshire boarding school for boys in the secondary grades. Fruit cup with sherbet, rolls, roast beef with gravy, olives, celery, broccoli with hollandaise sauce, potatoes, and ice cream with fudge sauce were on the menu. Several boys in the infirmary and the school nurse also became ill after eating a meal delivered to them from the main kitchen.

On the evening of February 17, 2 days after the banquet, another outbreak occurred following a meal which included roast beef, leftover after the banquet, and baked ham as the meat dishes.

Records in the school infirmary indicated that similar incidents, although having a much lower attack rate, occurred on November 20, 1958, and on January 10, 1959.

The attack rate of the post-banquet outbreak of gastroenteritis was approximately 70 percent, with 14 percent admitted to the infirmary for treatment. All victims confined to their dormitories were supplied with medication.

Onset was characterized as sudden, with

severe abdominal cramps followed by nausea, vomiting, and profuse diarrhea. The incubation period varied from 2 to 4 hours. Acute symptoms subsided in most instances after 4 hours, with almost complete recovery in from 12 to 24 hours.

Physical examination revealed a low-grade fever up to 101.4° F. in most instances. Pulse was weak and thready but improved within an hour. There was no abdominal rigidity or localized tenderness. Blood counts and urinalyses were essentially normal. Food poisoning was indicated.

#### Investigation

Upon questioning, it was found that the only food eaten on the night of the banquet by both the school nurse and her patients in the infirmary and the guests in the main diningroom was roast beef without gravy and broccoli without hollandaise sauce. It was also found that the students who ate leftover roast beef for the evening meal, February 17, became ill, while students who ate ham at this meal did not.

Following the banquet meal, food samples of leftover milk, hamburger which had been served at the noon meal preceding the banquet, roast beef, ice cream, chicken à la king served February 13 as the evening meal, onion soup, and chicken soup were collected in sterile containers for bacteriological study. Media used for isolation were selenite F broth, S.S.

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agar, desoxycholate agar, 110 medium, mannitol-salt agar, and Colbeck Ey agar. All these sampled foods were negative for *Salmonella*. The roast beef, however, showed a heavy growth of *Staphylococcus aureus*.

The school kitchen appeared tidy and well organized. Dishes were machine washed at recommended pressure and temperature. The temperature in the walk-in refrigerator was maintained between 40° and 50°F. Seven employees worked in the kitchen, four men on a full-time basis and three women part time. This staff showed no visible evidence of skin lesions of infection and denied any infection or illnesses which could be related reasonably to the outbreak.

Cultures were taken from the throat and stool specimens of each member of the kitchen staff on four different occasions, at 3- to 4-week intervals. Results of these cultures showed consistently that six of the seven persons employed were positive for *S. aureus* in cultures from either or both throat and stool specimens. Cultures from stool specimens, taken from two ill students immediately following the banquet incident, were also positive.

All of the *S. aureus* cultures isolated from humans and food samples, when tested for coagulase reaction, were positive. Although the phage pattern of some of the cultures varied to a slight degree, all fell in the broad group 3 and were remarkably similar in their response to sensitivity tests. Throat and stool cultures of three of the seven employees in the kitchen as well as the stool cultures taken from the two ill students, exhibited an identical phage pattern ( $7+/42E\pm/73\pm$ ) to the culture isolated from the roast beef. The staphylococcus isolated from the roast beef, phage typed to group 3, was found to be enterotoxigenic using the cat injection test. All cats injected with this culture filtrate exhibited vomiting within 30 minutes to 3 hours after injection.

Tests of the swabbings taken at random in the kitchen showed heavy contamination of a coagulase-positive staphylococci on the meat slicer, the meat block, and the floor. Five of the ten swabbings showed coagulase-positive staphylococci.

## Discussion

It is assumed that the extensive "seeding" of the kitchen environment with staphylococci by the personnel who were carriers, coupled with unsatisfactory food handling, accounted for the repeated episodes of food poisoning at this school.

An inspection of the walk-in refrigerator showed many items of leftover food. It was apparent that the chef was not inclined to discard leftovers, preferring to keep them and serve them again at future meals.

It was also learned that it was the practice of the chef to cook all meats and other foods early in the morning of the day they were to be served, rewarming these foods just prior to serving the evening meal. Even when he was informed that this practice allowed an incubation period for food poisoning organisms, the chef was reluctant to change, since the time interval permitted the staff to enjoy an afternoon siesta.

After several educational conferences with school administrators stressing the necessity for proper handling and refrigeration of all foods, the chef was ordered to correct his practices or leave. The improper practices were corrected immediately.

The remedial measures suggested were aimed at prevention of food contamination and removal of its source from the staff and the kitchen environment. They included cleansing and sanitizing the walls, ceiling, and floors of the kitchen; cleansing and sanitizing all kitchen utensils and work surfaces; treatment of the six kitchen staff members with antibiotics based on sensitivity studies of the cultures of staphylococcus isolated from their throats and stools; and instruction of the staff in the proper handling of food.

This study is of particular interest because of the repeated occurrence of food poisoning outbreaks traceable, not to the usual boils or other infected skin lesions of human carriers, but to pathogenic staphylococci shed from the noses, throats, and gastrointestinal tracts of chronic carriers. This type of carrier is a potential community hazard in that he may be a source of infection to others.



# CHEMOTHERAPY

*a public health measure*

## AGAINST TUBERCULOSIS

EDWARD T. BLOMQUIST, M.D.

*Some considerations on how to act upon the major recommendation of the Arden House Conference on Tuberculosis.*

THE present status and future of tuberculosis control in this country was considered at the Arden House Conference on Tuberculosis held November 29–December 2, 1959. All of us closely involved felt at the time that it was an important conference, and the attention and consideration it has attracted offer proof that we were right. Many ideas and proposals have resulted from this conference, and there has been time for them to be examined critically. The ones that have survived are not revolutionary; they are practical, however, and this means a good deal.

The following thoughts have grown from many conversations, discussions, and even arguments on how the major recommendation of the Arden House Conference can be translated into action. I felt obligated to summarize my ideas this way since time is important. It seems to me imperative that suggestions on practical steps for carrying out the Arden House recommendations be advanced quickly, and to all interested in this field. If all of us concerned with tuberculosis in this country do not act quickly, a real opportunity will be lost. We must make the Arden House Conference produce something more than words and

justify the interest and enthusiasm it has engendered.

### The Present Situation

Since chemotherapy came into use, the death rate from tuberculosis has gone down sharply. Although the case rate has also been moving downward, it has apparently been affected less by the new drugs. The relatively slow decline of case rates can be accounted for in part by the large proportion of tuberculosis cases in the United States that result from the breakdown of old infections. At the present time no measure is available to prevent most of these, but more adequate treatment of all cases that do occur could prevent the cases that arise from recent exposure. In addition, it could prevent the new infections in those who would become the tuberculosis patients of the future or subjects for prophylactic treatment, if that becomes a reasonable measure. This, I believe, was the rationale back of the major recommendation made at Arden House.

Of course, to a great extent it is a reiteration of long-accepted principles. Casefinding, diagnosis, and treatment have been the basis of tuberculosis control for many years. But when treatment was a long, drawn-out course requiring months or years of bed rest, it was necessarily to a large extent the separate responsibility of

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the hospital. When patients could not get into a hospital, most health departments made an attempt to effect some kind of isolation in the home and to provide such outpatient treatment as there was, but this was always regarded as less than satisfactory. Ideally, the patient entered the hospital and stayed there until he had fully recovered.

Under optimum conditions, chemotherapy can reverse the infectiousness of most tuberculosis patients within 3 to 5 months, and of many, much sooner. Most patients under chemotherapy do just as well whether they are ambulant or on bed rest. Obviously, therefore, the majority of patients need not be in a hospital for the entire course of their treatment. Indeed, some patients can be satisfactorily treated without ever going to one.

As a result of these new wonders, the average term of hospital care has become shorter, and many tuberculosis hospitals have closed or converted to other purposes. The quite reasonable assumption is that tuberculosis patients now can be more economically treated in the community. The trouble is that while outpatient treatment can be adequate, it often is not. Health departments have not been staffed or equipped to take care of large numbers of tuberculosis patients. The declining death rate and the closing of hospitals have been interpreted by the public as evidence that tuberculosis services in general can be cut back, and health departments are in considerable difficulty keeping what they have. New treatment services, either in the health department or in other community facilities, are rarely considered. Tuberculosis specialists are in short supply. Few young physicians now choose this specialty, and as tuberculosis hospitals close, members of their medical staffs retire or go into other fields of medicine.

In a great many communities, therefore, most tuberculosis patients are getting inadequate treatment or none at all. They remain as much of a potential problem in public health as were the patients on hospital waiting lists in pre-chemotherapy days.

#### **A Different Approach in Control**

The solution, it appears to me, lies in changing the order of our thinking about tuberculosis control—in being realistic in terms of the tools

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#### **Arden House Conference Recommendation**

The major recommendation of the conference is a program for the widespread application of chemotherapy as a public health measure for the elimination of tuberculosis in the United States.

*Goal.* To sterilize that important part of the reservoir of tubercle bacilli that presently exists throughout the country in persons currently suffering from active tuberculous disease, whether presently known or unknown to public health authorities, and in selected persons who previously have had active disease and were inadequately treated.

*Technique.* Mobilize all resources for a widespread application of the scientifically demonstrated and medically accepted procedures of adequate chemotherapy. These include the proper dosage of appropriate drugs or combination of drugs given continuously over an adequate period of time—procedures that are known to destroy tubercle bacilli in the human body, render the patient's disease non-communicable to others, and minimize the possibility of reactivation.

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we now have to work against the disease. Where we used to say, "We must find all the persons with tuberculosis, and then treat as many as we can—at least then we will know who they are," I believe the Arden House recommendation is asking us to say, "We will treat all the persons with tuberculosis, and of course, since we do not know who some of them are, we must find them in order to treat them." If we place treatment at the center of our thinking, it can be a much more effective public health measure than it has been so far.

I should like to warn against equating "public health" with "health department." In our complex social organization, a great many agencies and individuals, both public and private, are engaged in activities concerned with public health. Poliomyelitis or DTP injections protect the public health whether they are given in the health department or the private physician's office. In some places, the health department provides treatment for tuberculosis patients in clinics or hospitals or both; in others, the health department does not give any kind of medical care, but treatment is still a public health meas-

ure. Casefinding for tuberculosis is public health activity, whether it is done by the health department or the tuberculosis association. To be sure, the health department has legal responsibility for tuberculosis control, but that does not mean it carries on all tuberculosis control activities in the community. Before any significant change in emphasis in this area can come about, there must be a change in the thinking and activities of many other agencies and individuals as well.

### Stages of Control

If we accept this interpretation of the major conference recommendation, what then can be done to carry it out? Certainly there will be wide variation in different areas, depending greatly upon the adequacy of present tuberculosis control programs, but the following general suggestions seem reasonable. For convenience, we can divide tuberculosis control as far as treatment is concerned into three stages: Stage 1, in which the community is not now able to provide adequate treatment for presently known active cases; stage 2, in which the program proposed for stage 1 is well underway; stage 3, in which programs for both previous stages are adequate.

*Stage 1.* In a community where any significant proportion of the patients with known active cases of tuberculosis are not receiving adequate treatment either in the hospital or at home, the first efforts should be to remedy that situation, by whatever means and using whatever resources the community has. Treatment would include the prophylactic administration of isoniazid to those groups of young children for whom its usefulness has been demonstrated. Casefinding should be deferred except for careful followup of all close contacts of persons known to have active disease and complete diagnosis of suspects among them.

*Stage 2.* If a high proportion, perhaps 75-80 percent, of persons known to have active disease are under treatment, and most contacts are being examined, casefinding should be extended, as resources are available, beyond the contact group to other high-incidence groups, but this should be done without taking staff time needed for treatment programs for active cases. The community is now in a posi-

tion to add to its treatment program the persons who have previously had active disease but are judged to have been inadequately treated. Prophylactic treatment for persons known to have recently converted from tuberculin negative to positive is also in order.

*Stage 3.* The community that has reached stage 3 presumably has found most of its active cases, and they are under adequate treatment. In addition, certain categories of inactive cases have been found and are being treated. It can then undertake to find and treat persons at especially high risk, such as tuberculin reactors with suspicious 14" by 17" chest X-rays or silicotics with large tuberculin reactions or X-ray changes, or both.

This proposal to consider tuberculosis control in three stages implies knowledge of the current status of tuberculosis cases. Details about what information should be gathered, and how records should be kept and data analyzed in order to have such knowledge, are not appropriate here, but the subject is of very great importance. Similarly, approaches to casefinding, although they will not be discussed here, will require careful judgment and planning.

Many communities in the United States, in spite of our generally favorable situation, are still at stage 1. That is, a considerable proportion of the known active cases in the community are not receiving adequate treatment. Concentrating control efforts on treatment may help in some instances, but in order to progress to more favorable stages, these communities will have to find ways of increasing treatment resources. Ideally, of course, tuberculosis treatment services include hospital care and outpatient care, coordinated in such a way that patients who need to be in the hospital can be, and patients who do not need hospital care can be taken care of outside of the hospital. Since such coordination is so often not the actual practice, I will discuss hospital care and outpatient care separately.

### Outpatient Care

The need to improve the quality of treatment received by tuberculosis patients outside the hospital is an insistent issue. Most big cities do provide adequate to excellent outpatient



treatment; because they usually have large caseloads, they may need more services and facilities, but the quality of their treatment programs is by and large very good. In many smaller communities, however, tuberculosis patients who are not in a hospital receive meager treatment or none at all. Little can be done to "mobilize all resources for a widespread application of the scientifically demonstrated and medically accepted procedures of adequate chemotherapy" in such situations without some new thinking and a willingness to explore every possibility.

Although new funds or additional professional workers are not easy to obtain for tuberculosis programs at present, the possibility of getting either will be much better if the best use is made of money and people now available and if specific proposals can be made for the use of new money. I have therefore been considering what is needed for good tuberculosis outpatient chemotherapy treatment and attempting to spell out a number of possible ways of providing what is needed. While the suggestions made are directed especially toward services for the 50 percent of patients who live elsewhere than in cities of more than 100,000 population, some of them may apply in urban centers as well.

The various services needed for a treatment program may be provided by different agencies or paid for from different funds, but the success of each in promoting the recovery of tuberculosis patients depends upon how well they all supplement and support each other. In most communities, the health department, because of its legal responsibility for tuberculosis control, is the most appropriate agency to coordinate all services for tuberculosis patients.

In the big cities the number of tuberculosis patients treated in outpatient facilities is sufficiently large to require full-time medical staff for tuberculosis clinics. Elsewhere, the limited time of consultant physicians is used for film reading or evaluation of patients' records, and it is common for tuberculosis patients to see a physician only very rarely. When the patient comes to the clinic, he sees a nurse, who has the responsibility of interpreting to him whatever information or recommendations the physician may have recorded when he reviewed the case.

She must answer the patient's questions and encourage him to continue treatment. Her record of her interview with the patient is all the physician has to go by except laboratory reports and X-rays. In this kind of situation, the nurse carries an inappropriate burden. The physician cannot give the professional services the patient needs, and the patient is often unsatisfied and disinclined to follow recommendations that reach him secondhand. For the patient with tuberculosis, certainly when it is active, seeing a physician once a month seems a reasonable requirement.

Remedies are not easily at hand, but a number of possibilities are worth consideration. The limited time of the tuberculosis specialist, who perhaps comes into the community only occasionally, might be better used in consultation with local general practitioners, who in turn could provide continuing medical care to patients. In this kind of arrangement, when patients were unable to pay, the local physicians could be paid for their services by the health department, the tuberculosis hospital board, or whatever agency is responsible for care of tuberculosis patients. The advice of the county medical society could be sought in selecting physicians, and in arranging for them to be paid. It would seem wise, moreover, for specialist consultation to be available to all physicians treating tuberculosis patients, whether the patient or the community pays for the treatment.

Another plan that has been found feasible in some areas is the staffing of tuberculosis outpatient clinics by physicians from tuberculosis hospitals. If clinics are held in communities within a reasonable distance from the hospital, it should be possible for them to be frequent enough to allow physicians to give patients appropriate personal attention.

In communities where the tuberculosis clinic caseload is not large enough to justify full-time medical staff but where there is a chest physician, or an internist or general practitioner with special interest and training in chest diseases, an arrangement might be made for part-time service from the private physician, for which he would be paid by the appropriate agency. A high proportion of tuberculosis patients now are not able to pay for long-term

medical care, and the number of those who can is in many areas not large enough to support a private practice. Fees paid for clinic work would in some instances make it possible for a physician to afford to specialize.

If physicians are to give proper treatment to tuberculosis patients, laboratory and X-ray services must be readily available. In the ideal situation, the physician has the laboratory report and X-ray, when he has ordered these, at the time he sees the patient. Too often the X-ray the physician sees is one taken at the time of the last visit, which may have been too long a time before to give a picture of the present condition. It may be necessary to have facilities that make it possible to develop and dry X-rays quickly, so that they can be taken on the day of the appointment, or to make special arrangements for patients to come in for X-rays a few days before their clinic appointments.

Laboratory work should include not only smears and cultures for *Mycobacterium tuberculosis*, but also drug sensitivity tests and, especially in some areas, tests for atypical organisms. If the health department does not have a laboratory, a local hospital laboratory may be able to do the work. Tuberculosis associations are a possible source of help in paying laboratory salaries or financing the training of laboratory staffs.

That a chemotherapy program cannot succeed without readily available drugs is a truism. Many programs, however, do not have a budget for this purpose. The cost of tuberculosis drugs is relatively low, but even a small amount of money may be beyond the means of a patient who is subsisting on a welfare budget. Or it may be the reason for lack of cooperation in one who is not very enthusiastic about following medical recommendations. If the health department or hospital board, or whatever agency is providing medical care, does not have funds for this purpose, they can perhaps get help from the tuberculosis association or other agencies in the community. The administration of funds for drugs belongs in the clinic, so that drugs can be readily given to patients without individual and separate arrangements.

The public health supervision of patients

with active disease is of course the responsibility of the health department and is done chiefly by public health nurses. If seriously ill patients are hospitalized and medical supervision of clinic patients is adequate, the nursing service needed for an outpatient tuberculosis treatment program can be given in most communities by the health department's generalized nursing service. When medical supervision is inadequate, however, patients may be carried as "active" or "activity undetermined" cases for long periods without evaluation. Thus the nursing caseload of tuberculosis patients becomes unreasonably large, and priorities for service difficult to establish. Patients may be neglected in the first few days after diagnosis when help given to them and their families in understanding their illness and learning what to do about it could have long-term benefits.

The public health nurse contributes so greatly to tuberculosis control that she often has pushed upon her tasks it is unreasonable to expect her to do. The sometimes laborious and time-consuming job of trying to locate a patient who has moved or cannot be found can be done by someone other than a nurse. This might be a part-time job for a trained layman, or a full-time job shared by several communities. Assignment of trained laymen for this purpose has been worked out successfully by at least one State.

In some areas, public health nurses give twice-weekly streptomycin injections, and this is another task that could well be done by someone else. If there is no visiting nurse service, a registered or practical nurse could be hired specifically for this purpose. Married nurses might be found who could take it as part-time work.

In all of these instances, if public funds are not available, tuberculosis association help might be sought to pay salaries.

Chemotherapy applied as a public health measure requires a system of providing services in a way that does not place the patient on one side and the community on the other. The patient's ability and willingness to accept treatment are as important as the services offered. While it cannot be denied that a small percentage of tuberculosis patients will remain stub-

bornly uncooperative in spite of every effort, most patients will stay with recommended treatment if it is possible and reasonable for them to do so.

The location of clinics is an important factor in such a system. While modern transportation allows one clinic to serve a fairly large area, it is not reasonable to expect patients to make a half day's journey to the clinic. Volunteers can serve effectively in taking patients to and from the clinic. If they cannot be recruited, and patients must use public transportation, some arrangement must be made to pay their fares.

Scheduled appointments and reminder letters should be a part of the system, and if volunteers can be found to interest themselves in getting patients to the clinic, they may be helpful in the reminding. The clinic itself should be made as pleasant and attractive as possible, and here again volunteers can often be helpful. A coat of paint may not transform dingy quarters completely, but it can help a great deal in making them more cheerful.

The area of economic and social assistance is too broad to discuss in detail, but a patient cannot be expected to stop work in order to protect the community from his infection unless the community takes some responsibility for income sufficient for food, shelter, and other necessities of life for him and his family.

The public health purpose of tuberculosis treatment also precludes withholding drugs or services from patients because they have left the hospital against advice or committed minor infractions of rules. It indicates instead a conscious attempt to work out with the patient a regimen that he can accept, even if it would not be the first choice of the physician. The patient's cooperation is so essential that all reasonable concessions are justified in order to obtain it.

### **Hospital Care**

Hospital care is the most costly single item in tuberculosis control. Even though a great many tuberculosis hospitals have closed or have been converted to other uses, rising unit costs have kept the total cost high. The most advantageous use of hospitals in the total program of tuberculosis treatment is therefore of utmost importance.

I think there is little disagreement with the concept that a period of hospitalization, beginning as soon as a diagnosis is established, provides the best circumstance for recovery for any tuberculosis patient. How long the patient should stay in the hospital is a matter about which there is a greater range of opinion. The most conservative position is that the patient should stay until he has fully recovered. While chemotherapy has made this a shorter period than used to be necessary, "full recovery" even today means about 18 months. The trend in many hospitals is toward much shorter stays, until the disease is inactive (about 9 months in the majority of cases), or, even less conservative, until the patient is no longer infectious (not more than 6 months in the majority of cases).

Two issues in addition to the theoretical "best circumstance" for treatment of tuberculosis need to be considered in recommended length of hospital stay. In both, it is implicit that in order to provide good care for tuberculosis patients the hospital must operate as a part of the community. The two issues are: first, whether the patient will continue to receive adequate care when he leaves the hospital; and second, whether he is willing to stay in the hospital or, in his own thinking, is able to do so.

Because of the first issue, it is not unusual for hospitals to keep patients, or to try to, for longer periods than now are actually necessary. Hospitals may be separated from community clinic services, either because they fall in different government jurisdictions or because they are geographically isolated, or both. In some communities, as I have already said, appropriate clinic services do not exist. For all of these reasons, it is not surprising that hospital staffs sometimes feel they are giving the patient the best chance of recovery if they keep him for the full course of his treatment. Looking at the matter objectively, and in terms of what is best for tuberculosis control, however, it seems apparent that a better course would be for the hospital to take a hand in providing clinic services, either in its own outpatient department or elsewhere, if its location makes that impractical. If the hospital is under one government department and an existing clinic in need of staff under another, negotiation may be necessary, but



such a situation is not an insurmountable obstacle.

An orderly plan for chemotherapy as a public health measure includes hospitalization for patients who need it when they need it, and therefore requires the wisest use of expensive hospital facilities—for newly diagnosed patients and for patients who need surgery or who do not respond to therapy. (Some patients remain infectious in spite of the best possible treatment, but it seems reasonable that such "lifetime" patients can be cared for with less than a full range of hospital services.) Physicians treating patients in clinics should be able to get them hospitalized when it is suitable. Clinging to the old patterns of prolonged stay for all patients admitted and separation of hospital and clinic does not fit into such an orderly plan.

The second issue, how the patient feels about hospitalization, is also a concern in public health. The AMA rates in many hospitals are very high. Even if one were to take the attitude that all those who left against advice should be rounded up and returned to a locked ward, it would be impossible to carry out that kind of policy. If, on the other hand, an attempt is made to accommodate recommendations somewhat to the patient's feelings about going to the hospital, it seems likely that more patients can be helped to get more benefit from hospital care. The patient who is dismayed at the prospect of months in the hospital can perhaps be persuaded to stay for 1 month. If that month is recognized as a planned short stay, and used as an opportunity for intensive care and education, it may prove more profitable in the long run than several months that end when the patient gets fed up and leaves.

A plan like this would of course require good prospects for outpatient care after hospitalization, and here again the hospital would have to have a part in the responsibility to see that it was provided. If the hospital is to continue as the principal purveyor of medical care for tuberculosis patients, it can no longer reasonably concern itself only with those patients who willingly stay for the recommended period.

I do not deny that some small percentage of patients, like a small percentage of the total population, are genuinely recalcitrant and will not cooperate with any recommended course.

For these, forcible isolation is probably the only solution. But many others would accept and follow through with outpatient treatment that was planned with them. And treatment that is less than ideal is better if it is completed than the best possible treatment if it is abandoned.

At the Arden House conference, one of the participants commented on the problem that arises because so many tuberculosis patients are in lower socioeconomic classes, while public health and medical professional people are chiefly from the middle class. He pointed out that the professional person often tries to impose his own ideals and aspirations upon the patient and is frustrated to get no response. Many of us, for instance, knowing the overcrowded, dilapidated, depressing (to us) homes some patients come from, feel that they ought to be happy to be in the nice clean hospital. We think they are ornery if they prefer to stay at home. It takes imagination, and a willingness to accept when we cannot imagine, to help patients toward a way to recovery, but success in using chemotherapy as a public health tool depends upon it.

### State Planning

Patterns for providing treatment services for tuberculosis patients vary widely in the States. In a small group of States, none of the public tuberculosis hospitals is supported solely by the State, and in a few they all are. The most common pattern, however, is a combination of State hospitals and county or city hospitals. Whether they are State or local, hospitals may be under the health department, a separate hospital department, or under the welfare department. Clinic services come under equally varied auspices.

While efficient and effective treatment services are possible under many different organizational plans, the present situation in tuberculosis does call for coordination at the State level, in order to make sure that patients are treated no matter whether they live in low or high incidence areas, and also for the sake of economical operation. It seems important now to plan services according to reasonable caseloads. Obviously it is wasteful for several counties in a State to run tuberculosis hospitals in which

many beds are unoccupied. Under a State plan, such counties can be encouraged to pool their resources, thereby saving both money and staff which can perhaps be diverted to outpatient services. In some areas of the United States, tuberculosis patients outside the hospital are too few to justify a monthly clinic in a single county. Even if county health departments can arrange for local physicians to give medical care, the State may need to see that laboratory services, perhaps X-ray facilities or interpretation or consultation, are provided. If local medical care is not available, the State may have to arrange for physicians to be brought in once a month to see patients.

The amount of direct service or financial assistance the State gives is not at issue. Any State health department should be able to serve in a coordinating capacity.

In a number of States, well-established precedents for intercounty cooperation enable the State health department to work out a State plan for tuberculosis treatment as easily as in States with completely centralized services. Where local autonomy is highly prized, however, a good deal of persuasion and convincing may be necessary. In this case, interpreting the advantages of banding together may have to be the job of citizens' groups such as the State tuberculosis association.

## Illegitimacy Report

A report on illegitimacy and its relation to aid to dependent children (ADC) has been published in booklet form by the Bureau of Public Assistance, Social Security Administration. The material was prepared at the direction of the Senate Appropriations Committee on the 1960 appropriation bill for the Labor and Health, Education, and Welfare Departments.

In transmitting the study, the Commissioner of Social Security, William L. Mitchell, pointed out that "the great majority (over two-thirds) of the children under 18 who were born out of wedlock are living with natural parents or relatives. Only one out of eight is receiving support through the aid to dependent children program." The study reveals that:

- Over a 20-year period the increase in illegitimate births has been from about 4 to about 5 in each 100 live births.

- Children of unmarried mothers represent 16 percent of all ADC children, and their families account for 20 percent of all ADC families. The proportion has risen not only because of the rise in the number of illegitimate children but also because the old-age, survivors, and disability insurance program has increasingly provided income for children whose fathers have died, with the result that few children whose fathers are deceased receive ADC benefits.

- Almost half of all aid to dependent children families have incomes, including their assistance payments, below the subsistence level measured by the States' assistance standards.

- The average time that ADC is received for children of unmarried mothers is less than 2½ years. The great majority of illegitimate children on ADC were born before the family received assistance.

- Many ADC families are partially self-supporting: almost half have income in addition to assistance, principally from earnings of the mothers and contributions from the fathers.

- More than 15 percent of the mothers of illegitimate children work full or part time.

The report states that "it would be surprising if the motivating factor in repeated pregnancies out of wedlock were the mother's desire to increase her assistance payment to cover part of the basic cost of rearing another child."

Entitled "Illegitimacy and Its Impact on the Aid to Dependent Children Program," the report used, in large part, material from many State and local agencies and private organizations. The National Office of Vital Statistics, the Public Health Service, and other government and voluntary agencies also analyzed and prepared special materials.

# Distribution and Control of Rats in Five Rocky Mountain States

F. C. HARMSTON, B.S., and C. T. WRIGHT, M.S.

COMPREHENSIVE investigations on the distribution and control of domestic Norway rats (*Rattus norvegicus*) were conducted from 1947 to 1955 in the Rocky Mountain area comprised by Colorado, Idaho, Montana, Utah, and Wyoming. These investigations sought data essential to the organization and operation of effective programs of rodent control at State and local levels.

The objectives were (a) determination of the distribution and relative population densities of domestic rats, (b) evaluation of the factors influencing their distribution, rate of spread, and degree of infestation, and (c) appraisal of the results of past and present control activities.

Representatives of the Communicable Disease Center, Public Health Service, who were assigned to the State departments of health, and Public Health Service Region VIII, Denver, Colo., conducted the investigations in cooperation with personnel from the State and local departments of health. In numerous instances, representatives of the U.S. Fish and Wildlife Service assisted in making the surveys and also contributed valuable information regarding the history of rat infestations and the attempts that have been made to control these rodents. Information of great value to the studies was also provided by agricultural extension officials, public agencies, and private individuals.

All the known areas of infestation in the five

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States were visited. No survey was made of remote communities and farming districts situated at considerable distances from main highways or railroads, or those isolated by desert or mountain barriers from known rat-infested localities. Visits were made to garbage and refuse dumps, packing houses, feed mills and elevators, dairies, livestock yards, hog and poultry farms, and other likely harborages and breeding places of rats in urban and rural localities. Canals and natural watercourses were also inspected, since it became apparent early in the studies that indiscriminate dumping of garbage and refuse along and into streams is a factor which contributes to the spread and maintenance of rat populations.

In this report, the term "rat" refers only to the Norway rat, since the survey revealed the presence of the roof rat (*Rattus rattus*) only in Salt Lake City, Utah. No reference is made to any of the various native rodents, such as *Neotoma*, which sometimes occur in or around human habitations.

Distribution of the Norway rat in Colorado, Idaho, Montana, Utah, and Wyoming, as ascertained by the studies from 1947 to 1955, is indicated on the map.

## Colorado

According to Silver (1) rats were reported in Denver in 1886, and by 1907, they were entrenched in most of the larger towns of the State. Our studies in Colorado showed that most of the towns and farming areas in the eastern half of the State are infested with rats. No evidence of rats was found at any locality within the San Luis Valley, which lies east of



the Continental Divide, and, with the exception of Salida, no evidence of rats was found in towns above 7,000 feet elevation along the eastern slope of the Rocky Mountains. Also, no evidence of rats was found in any locality in Colorado west of the Continental Divide. It appears that the dry, sparsely populated areas along much of the eastern slope of the Rocky Mountains have served as effective barriers to the migration of rats in Colorado.

### Idaho

Three widely separated areas of infestation were found in Idaho during the surveys conducted in 42 of the 44 counties of the State. No survey was made in Blaine or Camas Counties, both of which were authoritatively reported by personnel of the Idaho Department of Health to be free of domestic rat infestation.

The largest area of infestation in Idaho covers all or portions of nine northwestern counties. This area extends southward along the Idaho-Washington border from the south-central part of Bonner County through much of Kootenai, Benewah, Latah, Nez Perce, and Lewis Counties, east into Clearwater County, and thence south through an extensive portion of northwestern Idaho County. The infestation also extends eastward from Kootenai County through the rural and urban areas along U.S. Highway 10 in Shoshone County to within a few miles of the Montana line.

The exact date of the initial infestation of these northern counties is not known, but local residents reported that rats have been troublesome in certain localities of Kootenai, Latah, and Nez Perce Counties since the early 1920's. Reports indicated that the early infestations in these counties spread from the west to the southeast, implying that the initial infestations probably occurred when rats migrated into northern Idaho from heavily infested adjoining localities in the State of Washington.

Franklin, Bannock, and Oneida Counties in southeastern Idaho have been invaded by rats within the past 20 years. According to C. P. Maughan, district sanitarian, Idaho Department of Health, rats were first observed in Franklin County about 1940, when they apparently migrated northward from adjacent

Cache County, Utah, where severe infestations had developed during the 1930's. The spread of rats in Franklin County progressed at a rapid rate, probably because they were migrating from an abundant base population in Cache County, Utah. By 1954, rats were established in most of the towns and farming areas of Franklin County and had reached the Oxford and Swan Lake areas of southern Bannock County.

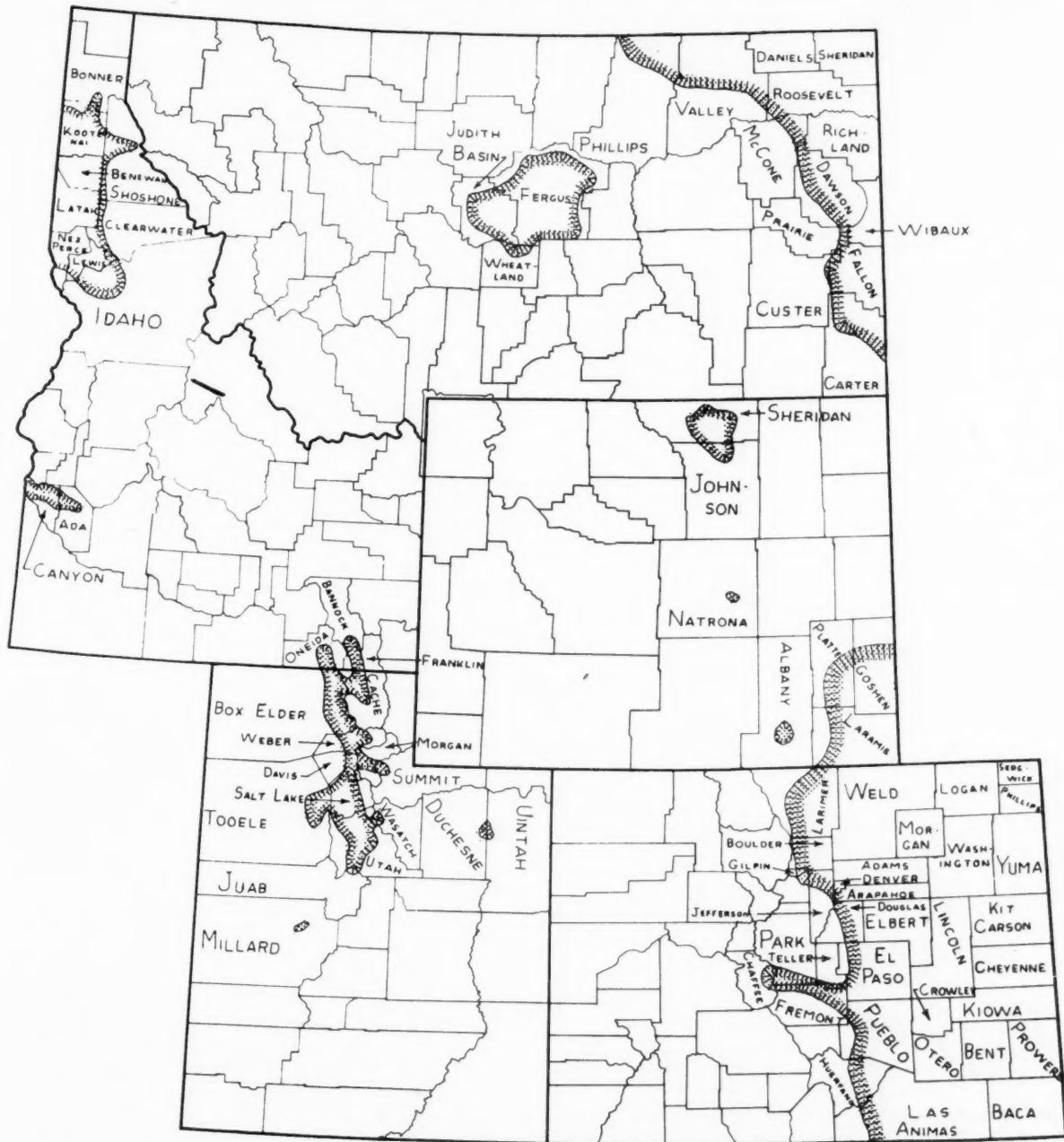
It appears almost certain that only a short time will elapse, in the absence of adequate control measures, before rats cross the divide between the Bear River and Snake River watersheds, and they will then have a favorable route of migration along Marsh Creek to the more heavily populated rural and urban areas in Bannock County. Rat infestation of this area would pose a serious problem, since it would open the way for rats to invade the entire upper Snake River Valley, which in 1955 was entirely free of rats.

Rat infestation of Oneida County, according to Maughan, was first reported in the spring of 1947, when a few rats were trapped at Woodruff, about 2 miles north of the Utah line. By 1950, rats were being reported in the vicinity of Malad. Surveys in the spring of 1954 showed a heavy infestation at Malad, but no evidence of rats at any of the ranches along U.S. highway 191 north of Malad and south of the Bannock County line.

In southwestern Idaho, portions of Ada and Canyon Counties have become infested in recent years. The first reported infestation of Ada County was in 1946, when a few rats were trapped in Boise. A survey of southwestern Idaho in 1949 revealed that rats had begun to migrate westward from Boise along the Boise River.

As a result of the survey in 1949, which indicated that rat populations in Boise and vicinity were increasing rapidly, a program of rodent control was initiated by the Boise City-Ada County Health Unit in conjunction with the Idaho Department of Public Health. Despite this control program, which included the use of poisons and elimination of open dumps along the Boise River, rats continued to spread westward, and in the spring of 1953, they were first reported in the vicinity of Caldwell and Nampa

Distribution of the Norway rat (*Rattus norvegicus*) in Colorado, Idaho, Montana, Utah, and Wyoming in 1955



in Canyon County. The infestations in Ada and Canyon Counties have thus spread through a fairly heavily populated area, approximately 40 miles in length and 15 miles in width, during a period of about 10 years. The rate of migration in Ada and Canyon Counties was much faster than in Franklin and Oneida Counties, probably because of the relatively few people in the latter two counties. The spread of rats

in these four counties illustrates the cumulative effect of short, local wanderings which enable rats to spread over extensive areas in a short time.

#### Montana

Silver (1) indicates that Montana was the last State permanently invaded by the domestic

rat. He states that a few rats were found in Lewistown, Fergus County, during the summer of 1926, and that investigations indicated that the initial infestation occurred about 1923. He also states that rats were introduced into the Fort Benton area of Chouteau County during the early days before railroads, when freight for mining camps was transported up the Missouri River by river packet. For a time, rats were reported to be quite numerous in the Fort Benton area, but later they disappeared. Silver further states that rats gained a foothold in Helena in the early days, but since have entirely disappeared.

Tryon (2) refers to the first permanent establishment of rats in Montana as occurring in Lewistown at some time between 1920 and 1925. This infestation is stated to have spread over most of Fergus County by 1936, and westward through much of Judith Basin County by 1947. According to Tryon, rats also entered the eastern part of the State near Sidney in Richland County about 1936, and within a few years had spread through most or part of the nine counties of Daniels, Sheridan, Valley, Roosevelt, Richland, Dawson, Wibaux, Fallon, and Carter. The infestation in eastern Montana spread rapidly during the decade 1936-1946 as a result of migrations from abundant base populations in adjoining areas of North Dakota and the Province of Saskatchewan in Canada.

During 1950 and 1951, studies relating to the problem of rodent control in Montana were conducted in 46 of the 56 counties in the State. The surveys did not include all counties lying west of the Continental Divide, inasmuch as this area was reported to be free of rats. The studies showed that much of Fergus and Judith Basin Counties was infested with rats. However, no evidence of rats was found in the Fort Benton area or in Helena. The area of infestation in eastern Montana was found to include most of the communities and farming districts bordering the Province of Saskatchewan, Canada, on the north, and North Dakota on the east. This area included all or portions of 12 counties extending from the northeastern part of Phillips County which adjoins the Canadian border, to the northern part of Carter County in the southeastern section of the State.

From available information, it appears that

the rat infestation of Fergus, Judith Basin, and Wheatland Counties in central Montana was originally established by common carrier at Lewistown. The invasion of counties in eastern Montana was accomplished by the migration of rats overland, apparently without the aid of commercial vehicle or other manmade transport. All the migrations followed streams or highways and roads, and moved relatively faster in the more thickly populated areas. In the thinly settled ranching districts of the State, the rate of migration was slower, indicating that the scarcity of settlers is a factor inhibiting the rapid migration of rats. The rat invasion of eastern Montana has demonstrated that by reason of their high biotic potential and their adaptability to different environmental conditions, rats are capable of spreading across extensive areas in which the situations are marginal for them.

## Utah

The rat-infested area of Utah was found to include most of the central valley of the State from the Idaho border south to the northeastern part of Juab County, bordered on the east by the Wasatch Mountains and on the west by the Great Salt Lake and Utah Lake. Isolated infestations were also found at Park City in Summit County, Delta in Millard County, and near Roosevelt in Duchesne and Uintah Counties.

During the early period of settlement, Silver states that rats were not present in Utah in 1888, but in that year they were reported to be abundant in Albuquerque, N. Mex., and were known to be present in Arizona. Allen (3) reported that there was no evidence of the house rat in the Salt Lake Valley, Utah, in 1874 but that the house mouse had been introduced into that area and was common in homes and fields.

The earliest authenticated record of the presence of rats in Utah was provided by the late N. W. Pickett, former senior sanitarian, Utah State Department of Health. According to Pickett (personal communication, 1948), rats were first observed in Salt Lake City about 1900, but for several years afterward they were apparently low in numbers and were observed only in the western portion of the city in the



immediate vicinity of the railroads. This would suggest that the domestic rat was imported into Utah by railway cars. By 1914, rats were reported to be causing considerable damage in grocery stores in the downtown area of Salt Lake City, and were present in large numbers at the Utah State fairgrounds in the western part of the city.

From available information (personal communication from DeLore Nichols, former agricultural agent, Davis County), rats first appeared in Davis County between 1916 and 1918 at which time they were most numerous in the southern portion of the county, particularly in the Bountiful area. By 1920, the infestation had spread northward to the vicinity of Centerville and by the autumn of 1927, nearly all portions of the county were infested. The infestation of Davis County apparently resulted when rats migrated from the base population in adjacent Salt Lake County.

S. R. Cunningham, former chief sanitarian, Ogden City Health Department, informed the senior author that the presence of rats in Ogden, Weber County, first came to his attention in 1903 when he investigated rat infestation at a bakery located in the west portion of town. Since this bakery was located in the vicinity of the railroads, it appears likely that the original infestation at Ogden, like that at Salt Lake City, resulted when rats were transported into the area by railway.

According to R. A. Madsen, former city sanitarian, Brigham City Health Department, the first instance of damage resulting from rats in Brigham City, Box Elder County, occurred in 1922 when poultry producers reported serious damage to stored feeds and loss of chicks and eggs. Residents in other areas of Box Elder County stated that rats were first observed in the vicinity of Willard about 1920, but they were not observed in the Corinne, Plymouth, and Collinston areas until about 1935, and not until about 1940 at Portage. The migration of rats in Box Elder County apparently progressed in a northerly direction and required about 20 years to cover the area from the Weber County line to the Utah-Idaho boundary.

The first authenticated record of rats in Cache County in the north-central part of the State, is supplied by Dr. E. G. Titus, former

head of the department of zoology, Utah State University. Dr. Titus informed the senior author that an infestation of rats at Cache Junction was called to his attention in the spring of 1911, and this was his first experience with domestic rats in Utah. The presence of rats in Cache Junction in 1911 and the fact that this community was then an important center for the shipping of grain suggest that rats were brought into Cache Valley by the railroad. Moreover, there were no known infestations at that time in the adjacent counties of Utah or Idaho from which the rats may have migrated into Cache County.

The presence of rats east of the Wasatch Range in Utah was first reported to the senior author during the autumn of 1949 by P. H. Kiser, sanitarian, milk division, Salt Lake City Health Department, who had just returned from Duchesne County where he found a dead Norway rat in a metal watering trough at a dairy located one mile south of Roosevelt. Subsequently, a survey in the fall of 1949 showed rats to be present at this dairy and several were trapped at an adjacent hog farm and the nearby community garbage dump. Exhaustive surveys during 1950 and 1951 disclosed no evidence of rats elsewhere in the Uintah Basin, or in any other locality in Utah east of the Wasatch Mountains. In the fall of 1955, rats were observed at farms situated along Cottonwood Creek several miles east of the Roosevelt community refuse dump. This constituted the first record of rats in Uintah County. Information obtained from surveys conducted during 1949 to 1955 indicated that the rat population in Duchesne and Uintah Counties was low in numbers and confined to the vicinity of Roosevelt. This suggests that rats were introduced into this area at a relatively recent date, and sufficient time had not elapsed for them to become widespread.

### Wyoming

With respect to the early history of rat infestations in Wyoming, Silver (1) wrote as follows: "With exception of Montana, Wyoming has been the last State invaded, the first rats apparently crossing the border from Nebraska about 7 years ago (1919), while at the present

time they are reported as having worked their way up the Platte River Valley as far as Fort Laramie and as being common along much of the Nebraska line. They are also firmly established at Sheridan, not far from the Montana line."

During the rodent surveys from 1947 to 1955, all of the counties of Wyoming were visited, and four widely separated areas of infestation covering portions of seven counties were found within the State. Of these infested areas, the most extensive is located in the southeastern corner of the State and includes a large portion of Laramie County and parts of Goshen and Platte Counties. At present, most of the towns and ranches along U.S. Highways 85, 87, and 26, from Guernsey, Fort Laramie, and Wheatland in the north to the Colorado line in the south, are infested. In all probability, these infestations developed during the past 40 years as a result of the rats advancing westward from base populations in adjoining areas of Nebraska.

More recently, rats have been introduced into Albany County. In 1947, intensive surveys disclosed no evidence of rats at Laramie and vicinity. However, when the area was again surveyed in 1949, a few rats were observed at an animal byproducts plant located several miles north of Laramie and also at several points along the Laramie River and railroads north of the city. The Laramie business and residential districts and the city dump to the northeast of the city showed no evidence of rat infestation during the latter part of 1949.

No evidence of rats was found at Casper or other localities in Natrona County during surveys in 1949 and 1950. Previously, in 1948, albino rats were reported inhabiting the Casper city dump, which is located east of the city and along the banks of the North Platte River. According to local officials, these albino rats were entirely eradicated by poisoning during the winter of 1948. There were no further reports of rats in Casper until the summer of 1954, when a few rats were detected and killed in the business and residential districts. In the winter of 1954, a survey disclosed rats at several places in Casper and also showed a light infestation of Norway rats in the outlying city garbage dump.

The surveys showed that a sizable portion of

Sheridan County extending from Ranchester and Dayton in the north, to Clearmont, Story, and Ucross in the south, is infested with rats. Also, it was found that rats have spread southward from Sheridan County along Clear Creek into Johnson County, but in June 1950 they had not reached the city of Buffalo. In the surveys of 1950, no evidence of rats was found in the extreme northern part of Sheridan County, from which it was concluded that rats had not migrated northward from this county into adjoining Big Horn County, Montana.

The rat infestations at Laramie, Casper, and Sheridan are isolated from other infested localities in Wyoming and adjacent States by extensive and barren uninhabited areas which restrain the natural migration of rats. In all probability, rats were introduced into these areas by means of the railroads or other man-made transport, reaching Laramie from about 1947 to 1949, Casper between 1950 and 1954, and Sheridan during the early 1920's.

#### Discussion

The foregoing information indicates how domestic rats have invaded extensive areas in the northern Rocky Mountain States and have become firmly entrenched in localities having wide diversity in physiography, vegetative cover, and land utilization. Many of these infestations have developed during the past 30 years despite rat-poisoning campaigns conducted at local and county levels.

In localities of the northern Rocky Mountain States where rats had become firmly established before control operations were undertaken, poisoning campaigns have resulted only in a temporary reduction of the rodent population and have failed to prevent the spread of rats into adjoining uninfested areas. At three localities in Utah, notably Blue Creek in Box Elder County, Kimball Junction in Summit County, and the Ingraham ranch located 2 miles south of Mona, Juab County, poisons have been utilized to eradicate incipient and isolated infestations. In each of these places the rats were detected and destroyed before they had time to propagate and become well established. It appears highly probable that rats will continue to follow a pattern of population expansion

similar to that of the past, and new areas in the Rocky Mountain States will continually be invaded unless control measures more effective than the brief poisoning campaigns employed in the past are initiated and maintained.

The failure to recognize the extreme propensity of rats for becoming entrenched in any environment that provides them with adequate food and harborage has been the chief reason why effective, permanent control has not been achieved in the Rocky Mountain States. With few exceptions, all of the rodent control work in these States has been conducted on a request or complaint basis due to lack of personnel at both State and local levels for this purpose. A few cities such as Salt Lake City and Provo, Utah, and Boise and Lewiston, Idaho, have made noteworthy progress toward eradication of rats from their business and residential districts. In these cities, highly effective control programs, based on the elimination of food supplies, harborages, and breeding places of rats, were initiated during the 1940's. In other localities where eradication or control of rats has been attempted by brief poisoning campaigns and without regard to the elimination of rat harborages and food supplies, little or no success has been achieved. The experience acquired in the northern Rocky Mountain States during the past 30 years has clearly demonstrated that control of the Norway rat is a highly skilled profession, and to be successful, a control program must have intelligent planning, trained leadership and guidance from the State level, and full support and cooperation of the public in order to eliminate the food supplies and harborages upon which rats are dependent.

The domestic rat is unquestionably the most destructive mammalian pest, and a serious menace to public health. Sylvatic plague exists in native rodents in most of the western and Pacific Coast States. Urban sections adjacent to areas where wild rodents are infected with sylvatic plague, face a plague threat through the possible infection of domestic rats by transfer of fleas from native rodents, as noted by Hartwell and associates (4). With the exception of murine typhus, which in North America is mainly confined to the southeastern States, and sylvatic plague, which exists in wild rodents in

the western States, other ratborne diseases including leptospirosis, trichinosis, ratbite fever, and salmonellosis may occur anywhere that rats exist.

It is now the opinion of public health workers that the ideal approach to control of domestic rodents is through a program of education whereby the general public is made aware of the menace to public health and the severe economic losses caused by rats. Local, county, and State departments of health, which have established procedures for reaching all segments of the population in matters of public health, are in a position to initiate an educational program of this nature. County agricultural extension agents are in an extremely advantageous position to distribute information to the residents of rural areas relative to the advantages of rat control and the importance of maintaining their premises free of harborages and breeding places of rats. Municipal officials who have responsibility for the collection and disposal of garbage and refuse should take steps to eliminate open refuse dumps by providing sanitary landfills or other approved methods of refuse disposal. In the areas of infestation, open dumps are a serious obstacle to the success of rat control programs. In areas presently uninfested, open dumps should be eliminated as a practical rat-exclusion precaution.

The following basic measures are essential to the success of a permanent control program:

1. Good general sanitation, with particular emphasis on proper garbage and refuse storage, collection, and disposal.
2. Rat stoppage and rat eradication in existing buildings.
3. Ratproof construction of new buildings.
4. Rat-poisoning programs.

The enactment of suitable rodent control and other sanitation ordinances is essential to obtaining the first three items listed. All four items are considered essential in a complete and continuous program. No one measure will be adequate, and all should be encouraged, although it may not be possible to initiate all phases of a control program simultaneously.

#### Summary

Investigations on the distribution and control of domestic rats were conducted in Colorado,



Idaho, Montana, Utah, and Wyoming, from 1947 until 1955. The studies showed domestic rats to be present in each of these States, and in the majority of cases, the areas of infestation are rapidly expanding despite periodic poisoning campaigns which have been used as the principal method of control during the past 30 to 40 years.

Since the northern Rocky Mountain area is one of the few remaining sections in this country where much territory is wholly free of rats, there exists a real challenge for local, county, and State departments of health, and other agencies concerned with safeguarding public health and the general welfare to undertake programs to eradicate rats in the infested areas

and to prevent their migration to presently uninfested areas.

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*Photographs of their children induce mothers to keep appointments in a long-term study on their growth and development*

## Participation in a Longitudinal Study of Negro Infants and Children

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NUMEROUS problems accompany longitudinal studies in which participation depends on voluntary cooperation. The degree of cooperation obtained may be related to the type of population studied as well as to the benefits, if any, which participants feel they are receiving. Even under the most favorable conditions such factors as migration and loss of interest are difficult, if not impossible, to control.

Yet, as Senn has stated (1) longitudinal studies produce answers to certain questions that cannot be found by any short-term approach. It therefore becomes important to attempt to isolate characteristics, attributes, or traits which encourage or discourage cooperation in longitudinal research.

In the general area of public health research, it might be assumed that socioeconomic status will play an important part in the degree of

cooperation received. Simmons (2) raises the question of whether persons of lower status are as willing as those of higher status to inconvenience themselves in the present for possible benefits in the future. He further states, "The lower status individual may be much less likely to think that responsibility for his well-being rests solely with himself, and more likely to think that if something does happen the kin group will see him through."

Simmons feels also that there may be a tendency for "higher status patients" to reject the health worker because "they perceive his attempts to serve them at all as identifying them with the lower status people typically served by public health, and thus regard him as a threat to their social position."

In a study of a group of Negro and white mothers, Yonkoner, Gross, and Romeo (3) found that within 1 year after delivery more than one-half of the mothers had moved. This degree of mobility becomes a serious handicap if participants move outside the research area or fail to leave a record of their new addresses when moving within the research area.

Since 1953 the department of pediatrics of the George W. Hubbard Hospital, Meharry Medical College, has been studying the growth and development of Negro infants and children in Nashville, Tenn. It is our purpose to discuss some of the specific problems encountered in maintaining cooperation in the study, to describe some of the devices used to encourage

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cooperation, and to attempt to measure the influence of socioeconomic status and certain other factors in order to learn whether these are specific, determining characteristics in relation to cooperation.

### Methods and Materials

The study from which the data are taken has been described elsewhere (4-7). Basically, it consists of an analysis of anatomical, physical, and psychological factors influencing the growth and development of Negro infants from birth through 5 years of age. The mothers enrolled in the study are seen prior to delivery in order to obtain a prenatal nutrition record and a socioeconomic index of the family. After delivery, physical and bone X-ray examinations and psychological evaluations are made of each child at 3-month intervals from birth through 24 months and thereafter at 6-month intervals until the child is 5 years old.

Each mother is sent a letter 6 to 7 days in advance of the scheduled appointment, setting a specific time and day. The mother is invited to call the research office if another time or day is more convenient for her. When an appointment is missed, the medical social worker tries to contact the mother personally to insure that the child is seen. The research staff provides transportation to and from the hospital if the mother requests it.

Included in this analysis is a group of 523 mothers of children who were between 36 and 42 months of age by March 31, 1959. By that time each mother should have made at least 10 visits to the clinic. Not all of these mothers, however, were still being scheduled for appointments. Some had become inactive because of movement within or outside the city or lack of cooperation. The 11 mothers whose children had died are excluded from the study.

Of the 523 mothers, 247 who had moved and could not be reached or were not responsive were listed as inactive; 276 remained in the active group.

These two groups are compared to ascertain whether the active and inactive mothers differ with respect to socioeconomic status, number of children, education, age, and marital status and whether these factors have a bearing on continued participation.

The active mothers are also grouped according to these various characteristics to see if they are related to the number of appointments kept. Analysis by number of completed appointments was impracticable for the inactive group because of the varying ages of the children at the time of withdrawal (table 1).

The division into active and inactive groups should not be taken to mean that all mothers who become inactive are necessarily uncooperative. The three reasons for becoming inactive (table 1) reflect varying degrees of cooperation. Certainly the mother who is unresponsive is not necessarily comparable with the mother who moves outside the city.

While cooperation for the active group is measured for practical purposes in terms of the number of appointments kept, we are not assuming that the degree of clinical participation is a complete indication of clinical cooperation. The amount of effort required to obtain each appointment varies with each mother. Some mothers come in when scheduled with no additional prompting; some have to be reminded; others may break several appointments before one is kept. This, too, cannot be fully quantitated and is beyond the scope of this paper. Cooperation has been equated with participation since participation is after all the ultimate aim.

### Difficulty in Maintaining Cooperation

Undoubtedly all longitudinal research projects have problems in common. In addition there are difficulties peculiar to specific studies. The following apply to the present study:

- The high rate of mobility within the city greatly impairs followup because many of the mothers fail to leave forwarding addresses. Since they often do not establish separate households, they frequently cannot be traced. Almost three-fourths (72.6 percent) of the inactive mothers are so classified because they had moved. Of this total, 74.3 percent moved within the city, leaving no forwarding address or other means of being reached.

- A large number of homes have no telephone. When an appointment is missed, the social worker must contact the mothers personally, often making repeated trips.



**Table 1. Percentage distribution of 247 mothers who became inactive, by age of child and reason for withdrawal**

Age of child (months)	Reason for becoming inactive		
	Moved within city (N=133)	Moved outside city (N=46)	Uncooper- ative (N=68)
3	1.5	19.6	5.9
6	4.5	2.2	
9	10.5		4.4
12	6.0	13.0	11.8
15	9.0	19.6	17.6
18	14.3	13.0	11.8
21	18.0	13.0	10.3
24	12.0	8.7	7.4
30	10.5	6.5	4.4
36 or more	13.5	4.3	26.5
Total	100.0	100.0	100.0

- Many mothers return to work before or shortly after the scheduled 3-month appointment. Generally, working hours of the mothers coincide with those of the research staff.

- The subsequent birth of children increases demands on the mothers' time. Also mothers with several young children frequently have a baby-sitting problem.

- After the first year of participation, many mothers feel that they can use the services of community well-baby clinics which are generally closer to their homes.

- Transportation to and from the hospital is often a drawback, especially for mothers with low incomes.

- Finally, there is the continuing problem of convincing each mother that she and her child are receiving some benefit from the research program. This is difficult because the program does not provide treatment for infants and children who are ill, unless such treatment cannot be given at the time by any other department in the hospital.

#### Devices to Encourage Cooperation

It was evident before data collection began that if participation in the followup clinic was to be at all representative, inducements would have to be offered to the mothers. Some of the following devices were decided on in advance,

while others were developed following experience in trying to maintain a high proportion of completed appointments.

- When an expectant mother was accepted for participation in the project, an attempt was made to record some telephone number other than her own at which she could be reached. This, theoretically, should have made it easier to trace mothers who moved and left no forwarding address.

- Efforts are made to accommodate working mothers and those with other young children. A relatively large number of Saturday appointments are scheduled for the working mothers. Mothers with children who are not enrolled in the study may bring them along with the participating sibling.

- Comforts are provided for the child who may have to wait his turn in the clinic. High chairs, toys, lollipops, and balloons rank high among the necessary items of equipment and supplies.

- As stated earlier, transportation to and from the hospital is provided whenever it is requested by the mother. This has proved a major inducement. In any given month, approximately 50 to 60 percent of all appointments kept are made possible through provision of transportation.

- Originally, no medical treatment was to be given to the participating children. It became apparent, however, that many mothers could see no advantage in continuing to bring their children. The program was therefore expanded to include a service phase providing on request a complete series of inoculations for the child.

- One of the most effective inducements has been the practice of mailing the mother a photograph of her child, taken at each appointment. Mothers may also obtain the negatives of these pictures. This practice was followed also by Moore, Hendley, and Faulkner (8). The photographs have been so effective in our study that many mothers now feel that they bring the child in "to have his picture taken."

#### Comparison of Active and Inactive Groups

The distribution of the active and inactive mothers by socioeconomic group is shown in

**Table 2. Percentage distribution of active and inactive mothers, by socioeconomic group<sup>1</sup>**

Socioeconomic group	Active (N=273)	Inactive		
		Moved outside city (N=43)	Moved within city (N=128)	Uncooperative (N=60)
I (low) -----	12.8	18.6	23.4	21.7
II -----	48.4	20.9	51.6	48.3
III -----	30.0	44.2	24.2	26.7
IV (high) -----	8.8	16.3	0.8	3.3
Total -----	100.0	100.0	100.0	100.0

<sup>1</sup> Socioeconomic data were unavailable for 19 cases. References 4, 6, and 7 describe the socioeconomic index.

table 2. The chi-square test (significant at the 1 percent level) indicates that there is some association between socioeconomic status and type of case. Approximately 60 percent of the mothers who moved outside the city are in the upper half of the socioeconomic distribution. This is perhaps a reflection of the fact that persons in the lower socioeconomic categories can ill afford to move from one city to another. The other three types of cases show relatively minor differences in their socioeconomic composition. The mothers who moved within the city and those who were dropped for lack of cooperation are perhaps more like each other socioeconomically than they are like the active mothers, but the difference is not outstanding. Variance analysis shows the association between socioeconomic status and type of case to be significant at the 1 percent level. The mean socioeconomic score falls in group II for all

cases except those mothers who moved outside the city, whose mean score falls in group III.

Comparative statistics on the background characteristics of the mothers are shown by type of case in table 3. Only socioeconomic status, discussed above, and education of mother are significantly associated with type of case. According to variance analysis, both factors are significant at the 1 percent level. Mothers who moved outside the city show evidence of higher socioeconomic status by having the highest mean educational attainment, 11.6 years. Education correlated more highly ( $r=0.665$  for all cases) with socioeconomic status than did any of the other factors being considered. Both the means and medians for educational attainment follow the same order as those for socioeconomic status, with mothers who moved within the city falling at the bottom. In both instances the active mothers are close in mean score to mothers moving outside the city, while the other two groups are similarly close.

Although no significant differences were found for age of mother and number of children by type of case, we again seem to have two sets of similar groups. For these two factors, the active and uncooperative groups are close in mean score, while there is very little difference in the mean scores of mothers who moved within and outside the city. Mothers who were dropped for lack of cooperation had the highest mean age and number of children.

Marital status of the mothers is shown by type of case in table 4. The chi-square test, applying only to the married and unmarried mothers, revealed no significant association be-

**Table 3. Comparison of active and inactive mothers, by age, number of children, education, and socioeconomic status**

Type of case	Age of mother (years)		Number of children			Education of mother (years)			Socioeconomic index	
	Mean	Standard deviation	Mean	Standard deviation	Median	Mean	Standard deviation	Median	Mean	Standard deviation
Active -----	25.5	5.9	3.0	2.0	3.0	10.1	2.5	10.6	27.2	12.0
Inactive:										
Moved within city -----	23.6	5.6	2.6	1.6	2.8	9.5	1.8	9.5	21.4	10.0
Moved outside city -----	24.1	4.8	2.5	1.5	2.6	11.6	3.0	12.2	30.3	13.4
Uncooperative -----	25.9	6.8	3.3	2.1	3.4	9.8	2.1	10.1	23.2	11.0

**Table 4. Percentage distribution of active and inactive mothers, by marital status**

Marital status	Active (N=276)	Inactive		
		Moved within city (N=133)	Moved outside city (N=46)	Uncoop- erative (N=67)
Married.....	78.3	72.2	76.1	62.7
Separated.....	3.3	4.5	2.2	3.0
Widowed.....	.7	.8	-----	-----
Divorced.....	-----	-----	-----	1.5
Unmarried.....	17.8	22.6	21.7	32.8
Total.....	100.0	100.0	100.0	100.0

tween these factors. Fewer of the uncooperative mothers were married, there being a very large divergence between this group and the active group. When only these two groups are compared, the chi-square test indicates an association between marital status and type of case which is significant at the 1 percent level.

#### Factors Presumed to Encourage Cooperation

Appointments kept by mothers who were active when their children were 36 months old are analyzed in relation to five background factors (table 5). Both the mean and median are discussed since the distribution departs significantly from normal distribution.

The mean number of appointments kept by all active mothers is 7.6 and the median is 8.7.

*Socioeconomic status.* The mean and the median number of appointments tend to increase as socioeconomic status improves, except for groups II and III which have the same mean and median. Regression analysis indicates a correlation ratio of 0.623.

*Number of children.* With one exception (table 5), the mean number of appointments kept decreases as number of children in the family increases. A somewhat similar pattern emerges when the median is used. Here a correlation ratio of 0.251 is found, indicating a lesser degree of association than exists between socioeconomic status and average number of appointments kept. The problem of maintaining the participation of mothers with several children has been discussed. Less difference than

might be expected is apparent, however, in the participation of mothers with one child and that of mothers with five or more children.

*Education of mother.* Of the factors for which correlation could be measured, education of the mother correlates most highly with average number of appointments kept. The correlation ratio is 0.764. Both the mean and median figures, however, show that the average number of appointments kept was greater for

**Table 5. Appointments kept by the active mothers in relation to socioeconomic groups and other factors**

Factors	Number moth- ers	Number appointments kept		
		Mean	Stand- ard devia- tion	Me- dian
<i>Socioeconomic group</i> <sup>1</sup>				
I.....	35	6.2	2.6	6.8
II.....	132	7.7	2.2	8.9
III.....	82	7.7	2.2	8.9
IV.....	24	8.2	1.7	9.1
<i>Number of children</i>				
1.....	65	8.1	2.2	9.4
2.....	72	7.6	2.0	8.2
3.....	51	7.2	2.4	8.3
4.....	42	7.6	2.4	8.9
5 or more.....	46	7.0	2.6	7.8
<i>Education of mother (years)</i> <sup>2</sup>				
Less than 8.....	47	7.0	2.5	7.8
8.....	46	7.2	2.5	7.9
9-12.....	142	7.8	2.2	9.1
College 1-4.....	40	7.7	1.9	8.4
<i>Age of mother (years)</i>				
15-20.....	67	7.3	2.2	8.0
21-23.....	64	7.4	2.2	8.2
24-26.....	45	7.5	2.3	8.7
27-29.....	45	7.2	2.6	8.4
30 or more.....	55	8.4	1.8	9.5
<i>Marital status</i>				
Married.....	216	7.7	2.2	8.9
Separated.....	9	7.7	1.6	7.0
Widowed.....	2	9.0	1.0	9.0
Divorced.....	0			
Single.....	49	6.9	2.4	6.4
Total.....	276	7.6	2.3	8.7

<sup>1</sup> Socioeconomic data were unavailable for 3 mothers.

<sup>2</sup> Amount of education was unavailable for 1 mother.



mothers whose schooling was completed between grades 9-12 than for those who had from 1-4 years of college. This deviation apparently is not great enough to mask a direct association between education and average number of appointments kept.

*Age of mother at delivery.* A slight degree of linear association between age of mother and average number of appointments kept was shown by regression analysis ( $r=0.1485$ ). Both the mean and the median increase with age. The differences are relatively small until the oldest age group (30 years or more) is reached. Half of the mothers who were 30 or older at the time of delivery had kept either 9 or 10 scheduled appointments.

*Marital status.* Significant association was found for marital status and average number of appointments kept, with the proportion being higher for the married mothers. The chi-square test was significant at the 5 percent level, using only the married and unmarried mothers. Those mothers whose marriages were broken were excluded from the correlation analyses because of the extremely small number, but comparative figures for them are included in table 5.

### Summary and Conclusions

Of a group of 523 mothers enrolled in a 5-year study in Nashville, Tenn., on the growth and development of Negro infants and children, almost half had become inactive by the third year of the study.

Comparison of the active and inactive mothers according to socioeconomic status, number of children, education, age, and marital status yielded the following results:

1. Significant differences exist between the four types of cases according to socioeconomic status and education of the mother. For both factors, the mothers who moved outside the city are highest on the scales. These mothers are closest in mean score to the active mothers.

2. Variations exist among the types of cases with respect to age of mother at delivery and number of children in the family, but these are not significant. For these two factors, however, mothers who were dropped from the study for lack of cooperation are closest in mean score to the active mothers.

3. When all of the categories are compared, no significant differences are found with regard to marital status of the mother. However, the proportion of unmarried mothers is significantly higher in the group of uncooperative mothers than in the group of active mothers.

With regard to participation of the active mothers as an index to cooperation, some degree of association was found for all of the background factors considered:

1. The strongest association between participation and any of the factors considered appears to exist for socioeconomic status and educational attainment, with mothers in the higher socioeconomic categories and the upper educational levels keeping more of their appointments.

2. Inverse association exists between number of children in the family and appointments kept.

3. Older mothers tend to keep more appointments than younger mothers, the difference becoming quite noticeable when mothers reach 30 years of age. However, mothers who were dropped for lack of cooperation had a mean age higher than that of any of the mothers, though not significantly higher.

4. Mothers who are married keep more appointments than do unmarried mothers.

In the final analysis, the degree of cooperation exhibited, as measured by participation, is a function of the person's maturity and feeling of responsibility as regards carrying through a commitment. The characteristics which are apparently allied with maturity and responsibility in the present context are also those which typify persons who move outside the city. This loss is, however, relatively small. Thus it would seem that if participation is to be representative of the various elements of the population being studied, extra inducements must be offered to those persons who do not possess the characteristics which seem to be allied with voluntary participation.

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## Plague Remains Modern Hazard

Vigilance against plague must not be relaxed, despite modern advances in fighting the disease, Dr. Karl Friederich Meyer of the University of California cautioned in his acceptance speech at the University of Chicago, where he received the Howard Taylor Ricketts Memorial Award for 1960 on June 6.

"What in 1928 was thought to be a localized epizootic entity in California," he said, "is now known to extend through 131 counties in 15 western States, an area comprising 40 percent of the continental United States from the Pacific Coast to the 100th meridian.

"During the period 1908-51, 98 cases (60 deaths) in eight western States have been contracted from wild rodents. There is every reason to predict that in that area, sporadic cases of bubonic plague may make an annual appearance."

Dr. Meyer, who is director emeritus of the George Williams Hooper Foundation for Medical Research and professor emeritus of experimental pathology at the University of California, attributed the special vulnerability in that State to the booming population. Although the building of suburbs will keep away appreciable wild rodent populations, he said, "There is an initial period of joint tenancy by people and wild and commensal rodents—a condition theoretically ideal for the propagation of plague."

Wholesale destruction of the diseased rodent population is not always possible as a preventive meas-

ure, owing to geographic and financial considerations, Dr. Meyer added.

Long thought transmissible only through rat fleas, plague is now known to spread through exchange of fleas of many wild rodents and other small animals, including ground squirrels, wood rats, chipmunks, prairie dogs, and field mice, according to Dr. Meyer.

Dr. Meyer traced the course of the plague in the United States since it was first diagnosed in a human in 1900 and in rats in 1902.

Plague reservoirs of rodents exist in South Africa, East Africa, Iran, and the Soviet Union. Soviet health workers have eliminated the danger on the fringes of their vast wild rodent area, but fear that plague may break out again or be reimported, Dr. Meyer said.

The sulfa drugs and the antibiotics have proved effective in treatment, allaying some of the panic caused by the appearance of human plague. Plague vaccines have been developed, but a dependable immunity cannot be achieved with a single injection, he added.

"Active immunization in the face of or during an epidemic is of little or no value, but a persistent long range vaccination program could serve as a supportive preventive measure." Modern chemotherapy is more effective in the vaccinated, Dr. Meyer believes.

## Gains in Outpatient Psychiatric Services, 1959

**O**UTPATIENT care for the mentally ill in the United States has expanded during the last 5 years in both the number of outpatient psychiatric clinics and the number of professional man-hours of clinic service. This conclusion is based on a comparison of data for 1954-55 (1) and 1959 from the nationwide statistical reporting program established for both governmental and nongovernmental outpatient psychiatric clinics by the National Institute of Mental Health in cooperation with State mental health authorities.

A net gain of almost 200 clinics increased the count of clinics in the Nation in 1959 to 1,429, an increase of 16 percent since 1954-55 (table 1). In addition to the opening of new clinics and the closing of others, the change also reflects some adjustment in the identification of outpatient psychiatric clinics. Clinics in existence but not identified in 1954-55 are now included; some clinics included in 1954-55 are no longer counted since it has been established that they do not satisfy the clinic definition. For reporting purposes, an outpatient psychiatric clinic is defined as "an outpatient mental health service unit with a psychiatrist in attendance at regularly scheduled hours who takes the medical responsibility for all clinic patients."

The number of clinic professional man-hours has increased at an even greater rate (37 percent). The number of professional man-hours is a better measure of the amount of clinic services available than the number of clinics because of the large number of clinics that are part time. Professional man-hours in 1954-55 totaled approximately 188,000 per week, with 1,178 clinics reporting; in 1959, this number had risen to 258,000, with 1,378 clinics reporting (table 1). The total professional man-hours reported include those of full- and part-time regular staff and trainees. The principal professional persons are psychia-

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### Highlights

A comparison of data for 1959 and 1954-55 shows gains in outpatient psychiatric clinic service:

1. The number of clinics increased from 1,234 to 1,429, an increase of 16 percent.
2. Scheduled weekly professional man-hours of clinic service increased by 37 percent to 258,000 hours.
3. The number of professional man-hours of clinic service available per week for each 100,000 population rose from 115 to 145.
4. Every State now has outpatient psychiatric clinic services.

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trists, clinical psychologists, and psychiatric social workers, but other professionals, such as public health and psychiatric nurses, pediatricians, internists, medical residents, psychometrists, group workers, and technicians, are included. Subsequent publications will provide information on clinic man-hours by profession.

The growth of clinic service both in terms of number of clinics and professional man-hours is almost nationwide. Forty-seven States reported increased man-hours between 1954-55 and 1959; man-hours were doubled or more in 10 States. Only six States show a decline in psychiatric clinic services.

Differences in man-hours reported for the two periods may represent factors other than a true change in services available. Staff turnover affects scheduled weekly man-hours reported because the staffing on the "reporting day" may be a temporary situation (2). Possible errors in reporting, especially for the first reporting pe-

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*Prepared by the Outpatient Studies Section, Biometrics Branch, National Institute of Mental Health, Public Health Service.*



**Table 1. Number of outpatient psychiatric clinics, number of scheduled professional man-hours per week in reporting clinics, and number of man-hours per 100,000 population,<sup>1</sup> by State, 1959**

State	Total clinics <sup>2</sup>	Professional man-hours per week in reporting clinics		Professional man-hours per week per 100,000 population	
		Number	Percent change from 1954-55 to 1959 <sup>3</sup>	Number	Percent change from 1954-55 to 1959 <sup>3</sup>
United States.....	1, 429 (51)	257, 904	+37. 1	145	+26. 3
Alabama.....	13	1, 348	+384. 9	43	+363. 0
Arizona.....	5 (1)	550	+60. 3	45	+23. 4
Arkansas.....	3	1, 193	+178. 1	69	+184. 3
California.....	85 (1)	22, 626	+50. 8	158	+30. 8
Colorado.....	17	3, 598	+92. 2	218	+71. 9
Connecticut.....	41	6, 452	+71. 8	268	+57. 6
Delaware.....	7	604	-3. 2	135	-19. 1
District of Columbia.....	17	4, 698	+21. 3	574	+22. 7
Florida.....	29	5, 617	+59. 6	120	+12. 3
Georgia.....	11	1, 372	+132. 1	36	+116. 7
Idaho.....	1	100	-73. 0	15	-75. 4
Illinois.....	84	19, 353	+23. 3	191	+11. 9
Indiana.....	20 (1)	3, 524	+40. 0	76	+29. 2
Iowa.....	16	2, 242	+31. 4	80	+25. 2
Kansas.....	21 (1)	5, 200	+36. 0	247	+29. 2
Kentucky.....	19 (1)	1, 082	+78. 0	35	+68. 8
Louisiana.....	22 (3)	3, 404	+16. 1	108	+6. 4
Maine.....	8 (2)	358	+42. 1	38	+34. 7
Maryland.....	48	5, 111	+74. 9	172	+50. 3
Massachusetts.....	81 (7)	18, 248	+26. 5	372	+27. 0
Michigan.....	52 (6)	8, 685	+39. 5	109	+24. 9
Minnesota.....	16	3, 339	-13. 0	98	-19. 3
Mississippi.....	5	394	+79. 9	18	+73. 3
Missouri.....	48 (11)	4, 713	+56. 8	112	+51. 6
Montana.....	3	237	-40. 0	35	-45. 2
Nebraska.....	10	1, 041	+5. 7	72	0
Nevada.....	3	326	( <sup>4</sup> )	120	( <sup>4</sup> )
New Hampshire.....	22 (1)	605	-3. 5	104	-8. 8
New Jersey.....	57	7, 359	+30. 2	125	+17. 4
New Mexico.....	2	123	+53. 8	14	+44. 0
New York.....	303	61, 646	+14. 1	375	+10. 3
North Carolina.....	15	3, 554	+129. 4	80	+113. 9
North Dakota.....	1	161	+80. 9	25	+81. 3
Ohio.....	61 (10)	13, 475	+35. 8	139	+23. 6
Oklahoma.....	5	1, 214	+101. 7	54	+92. 2
Oregon.....	15 (2)	1, 156	+30. 8	66	+22. 6
Pennsylvania.....	103 (3)	18, 678	+91. 4	165	+87. 1
Rhode Island.....	9	1, 440	+16. 1	170	+10. 8
South Carolina.....	6	785	+5. 1	33	-1. 5
South Dakota.....	3	454	+124. 8	67	+121. 2
Tennessee.....	11	2, 720	+431. 3	78	+413. 8
Texas.....	30	4, 695	+55. 1	50	+37. 5
Utah.....	6	739	-25. 9	84	-35. 1
Vermont.....	6	512	+49. 3	138	+51. 5
Virginia.....	25 (1)	4, 685	+74. 4	121	+53. 4
Washington.....	12	2, 531	+98. 5	92	+77. 3
West Virginia.....	8	795	+28. 8	41	+30. 6
Wisconsin.....	21	2, 906	+54. 8	73	+41. 8
Wyoming.....	6	46	+53. 3	15	+40. 8
Alaska.....	7	237	+107. 9	151	+117. 0
Hawaii.....	7	1, 156	+56. 9	193	+29. 3
Puerto Rico.....	2	657	+128. 1	28	+116. 2
Virgin Islands.....	1	160	+595. 7	( <sup>5</sup> )	( <sup>5</sup> )

<sup>1</sup> Provisional population estimates from Current Population Reports, Series P-25, No. 210, U.S. Bureau of the Census.

<sup>2</sup> Includes independent clinics, clinics operated by State or local governmental agencies, the Veterans Administration, and nonofficial organizations. Number which did not report man-hours shown in parentheses.

<sup>3</sup> Source of 1954-55 data, reference 1.

<sup>4</sup> No clinics reported in 1954-55.

<sup>5</sup> Population estimate not available for 1959.

**Table 2. Rank order of States according to number of scheduled professional man-hours per week in outpatient psychiatric clinics for each 100,000 population, 1959**

Rank	State <sup>1</sup>	Number man-hours per 100,000 population	Rank	State	Number man-hours per 100,000 population
1	District of Columbia	574	27	Utah	84
2	New York	375	28	Iowa	80
3	Massachusetts	372	29	North Carolina	80
4	Connecticut	268	30	Tennessee	78
5	Kansas	247	31	Indiana	76
6	Colorado	218	32	Wisconsin	73
7	Hawaii	193	33	Nebraska	72
8	Illinois	191	34	Arkansas	69
9	Maryland	172	35	South Dakota	67
10	Rhode Island	170	36	Oregon	66
11	Pennsylvania	165	37	Oklahoma	54
12	California	158	38	Texas	50
13	Alaska	151	39	Arizona	45
14	Ohio	139	40	Alabama	43
15	Vermont	138	41	West Virginia	41
16	Delaware	135	42	Maine	38
17	New Jersey	125	43	Georgia	36
18	Virginia	121	44	Kentucky	35
19	Florida	120	45	Montana	35
20	Nevada	120	46	South Carolina	33
21	Missouri	112	47	Puerto Rico	28
22	Michigan	109	48	North Dakota	25
23	Louisiana	108	49	Mississippi	18
24	New Hampshire	104	50	Idaho	15
25	Minnesota	98	51	Wyoming	15
26	Washington	92	52	New Mexico	14

<sup>1</sup> Excludes Virgin Islands, population estimate not available.

riod, 1954-55, may be an additional explanation for some differences.

To aid in determining the extent to which the growth in clinic services is keeping pace with needs for such services, the increase in man-hours must be related to changes in the population during the same time period. For the Nation as a whole, the number of professional man-hours of service available per week for each estimated 100,000 population increased from 115 to 145. All but a few States show some improvement in this ratio. The median State ratio was 88 man-hours for each 100,000 population in 1959 compared with 64 in 1954-55. The ratio continues to vary widely among the States, ranging from 14 to 574

(table 2). In part, differences are due to urban-rural patterns of services and the geographic distribution of medical and other professional training centers (1).

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## Translated Readings

The following items have been culled from the CIA *Scientific Information Reports*, distributed by the Office of Technical Services, U.S. Department of Commerce. Numbers following each item refer to the item and issue, in that order. All issues are from the PB 131891 T series.

### *Public Health Administration*

Mass aerogenic vaccination against anthrax was performed by Major General of the Medical Service N. I. Aleksandrov et al., experimentally in a hospital room with a volume of 40 cu.m., one window, and one door. From 40 to 50 persons, provided with seating and an intercom system, were vaccinated with three sprayers during each run. There were five series of vaccine from strains STI-1 and No. 3, with initial activity of 20-2,500 billion spores per gram. According to the activity of the vaccine, from 2 to 3 gm. were put into each sprayer, emitting 4 to 6 gm. into the room. Exposures ranged from 5 to 15 minutes.

In all, 363 men and women between the ages of 18 and 45 were immunized. In 1 to 3 weeks thereafter no ill effects were observed. Results of immunization tests were given in a table (not in the translation). It is concluded that spray vaccination makes it possible for a team of 5 or 6 to vaccinate 1,000 persons an hour (87, 32).

Plans for public health in 1960 in the U.S.S.R., outlined by S. V. Kurashov, Minister of Health, include construction of 2.4 million apartments and 1 million individual dwellings, graduation of 25,000 physicians and 68,000 "sub-professional" medical workers and pharmacists, and a 7 percent increase in public health expenditures. The Ministry urges the use of gamma globulin and vaccines to eradicate children's diseases such as diphtheria, whooping cough, and measles (145, 44).

A description of the system of medical services in Czechoslovakia, by E. Skrbkova, Moscow, reports absorption of social welfare depart-

ments by the health departments. The director of united therapeutic and preventive medical service of a rayon is also in charge of social welfare (84, 40).

Organization of public health institutions in Hungary, their history and functions, is described by Dr. Frigyes Doleschall, Minister of Health (85, 40).

Psychiatric rehabilitation in the U.S.S.R. is described by G. Martin, St. Joseph's Hospital, Berlin (160, 41).

### *Toxicity Studies*

A number of toxicity studies reported by U.S.S.R. scientists included reports by S. N. Golikov et al. on six derivatives of 1,3-amino-propanol; N. A. Zhilova, on benzene and acetone vapors; E. M. Bongard and V. F. Shlyapin, on ethylene oxide; L. A. Timofeyevskaya, on monoethanolamine; G. N. Zayeva, on anixole derivatives; and S. N. Kremnava, on bis-trichloramylsulfide. All authors are located in Moscow (117-121 incl., 45).

Toxicology of new chemical substances, with recommended tolerance limits, are published by S. N. Kremeneva et al., Moscow, for dichlorohydrin, nitrocyclohexane, silicochloroform, aminoanthic acid, and thiodivaleric acid (108, 46).

The toxicity of a trialkylthiophosphate insecticide, sold as Tinox, is reported by T. Hiepe and E. Seidel, Leipzig (110, 46).

Data on the toxicology of methylsystox, an organophosphorus compound composed of two isomers of dimethyl beta-ethylmercaptoethyl thiophosphate, is published by N. K. Statsek of Kiev (129, 44).

### *Occupational Health*

Industrial vibrations, their effects and preventive measures, are discussed by V. G. Trentyev, Moscow (69, 39).

A comprehensive list of the toxic gases, vapors, and dusts frequently found on industrial



premises, and the tolerance limits established by the chief State sanitation inspector of the U.S.S.R., are listed in a report by Z. B. Smelyanskiy and I. P. Ulanova, Moscow (83, 37).

Data on the action of low-intensity industrial irritants, both physical and chemical, with respect to the reactivity of experimental animals are offered by V. K. Navrotsky, Khar'kov. Physical factors included chilling, heating, and ultraviolet irradiation; the chemical agents were benzene, aniline, nitrobenzene, lead (acetate), tetraethyl lead, carbon tetrachloride, dichlorethane, sulfur dioxide, carbon monoxide, and aviation gasoline (107, 45).

Prophylactic use of oxygen for industrial workers, as reported by Prof. Kh. Vaynshteyn, Chelyabinsk, began experimentally 4 years ago with men in varnish, dye, and chemical factories. Oxygen in 60 percent concentration was breathed for 45 minutes at the end of the working shift, for a period of 15 to 20 days. The treatment is reported to be in wide use in the industrial centers of the Chelyabinskaya Oblast (81, 34).

#### *Infectious Diseases*

A direct method of obtaining a bacterial count for reservoir water within 2½ hours, said to be proposed in 1932 by A. S. Razumov, is recommended by L. Ye. Korsch, Moscow. A water sample is passed through a molecular filter which is dried, stained with erythrosin, dried again, and cleared with immersion oil. The organisms are counted by the immersion system with an ocular micrometer, and the number per milliliter calculated by formula (74, 33).

An improved, specific method of isolating types A, B, C, D, and F of *Clostridium perfringens*, on the principle of culturing suspect organisms between two indicator layers of agar, is detailed by B. D. Bychenko, Moscow (103, 44).

Experiments with aerosols of triethylene glycol and calcium hypochlorite to determine rate and duration of their effects on PR8 influenza virus, with white mice and chick embryos as hosts, are reported by Liu Yuan-yuan, Li Han-t'ang, and Wang Chih-lum, Peiping (85, 42).

Microtechnique for rapid determination of bacteria by biochemical reaction is described by

Tseng Fan-chi, Peiping. Identification of pathogenic enterobacteria is achieved in 20 to 24 hours, in contrast to 4 or 5 days by conventional methods. The investigators find the technique preferable to the paper disk method of Sanders et al. (123, 41).

Studies of an outbreak of Q fever in Baku in 1956 suggest that the gray rat is possibly a natural reservoir of the disease, according to N. N. Sterkhova and M. G. Akhundov, Azerbaydzhan (77, 34).

*Rickettsia tsutsugamushi* were isolated from an adult tick, *Ixodes*, by Juan Kuang-lieh, I Ying-nan, and Kao Ling-i, Fukien Institute of Epidemiology, and Cheng Pi-te, Fuchow Army Health and Epidemic Control Stations (85, 32).

#### *Basic Research*

A simple and precise method of calculating antigen-antibody reactions, as an aid to immunization studies, is the objective of a proposal by A. I. Nesterova, Moscow, to investigate the dielectric permeability of antigens, antibodies, and their suspensions. The authors describe one method of appraisal, with their data. The dielectrometer they diagram is based on the phenomena of resonance (92, 32).

Differences in light refraction between live and dead bacterial cells are the subject of experiments by B. A. Fikhman, Moscow. Bacterial specimens, in a clear gel prepared in distilled water, were examined in the immersion system of an MFA-2 anoptical microscope, capable of detecting changes in light refraction indexes lower than 0.001 (80, 32).

Rats with a high content of vitamin C in their tissues are relatively resistant to low-temperature effects, observes M. F. Merezhinskiy, Minsk (98, 34).

With the Krotov apparatus, G. I. Sidorenko, Moscow, performed 2,876 analyses of bacterial aeroplankton with samples taken at altitudes from 1.5 to 152 meters, November 1954 to December 1955 (102, 33).

Toxic properties of viruses are discussed by B. F. Semenov and V. I. Gavrilov, Moscow. The toxicity refers to the capability of viruses to cause pathological tissue changes which are not connected with the dispersion of the agent (162, 44).

# Program Notes

## **Radioactive Wastes**

Underground tank storage of highly radioactive liquid wastes is "not an ultimate solution," according to Dr. Joseph Lieberman, head of the Atomic Energy Commission's Environmental and Sanitary Engineering Branch, in an address prepared for the second sanitary engineering conference on radiological aspects of water supplies. Lieberman called for more research on ways of converting liquid wastes resulting from reprocessing of irradiated nuclear fuels into solids that can be safely disposed or stored for long periods of time and on systems for final disposal in specific geologic formations, obviating the use of tanks that eventually rust through.

There is not enough dilution available in nature, according to Lieberman, to allow the continual dispersal of these highly radioactive reprocessing wastes into the environment. He urged a vigorous effort to find absolutely safe and economical methods of disposition of the fission products from nuclear power reactors within the next 20 to 25 years.

## **Services for Migrants**

In Hollandale, Minn., 14 organizations joined forces in a community health project to hasten assimilation of migrant workers into Minnesota life.

At the request of the State employment service, a tuberculosis testing survey of the seasonal labor force needed and employed by local canning and refining industries was accomplished. Organizations participating included the Minnesota Department of Health, Freeborn County public health nurses and welfare board, physicians of the county medical society, the ladies aid societies of four churches, the Mineral Springs Sanatorium, the Minnesota State Department of Welfare, the Freeborn County Health Association, the Freeborn County

Tuberculosis Association, and the State Christmas Seal organization, as well as State and local employment services.

Of the 469 Mexican migrants from Texas surveyed, 238 persons were 15 years of age or older. And of these 238, 66.5 percent, or 158 persons, reacted positively to the tuberculin test.

## **Smoking in Pregnancy**

Infants whose mothers smoked regularly throughout pregnancy averaged 6 ounces less at birth than infants whose mothers were non-smokers, according to an investigation of 2,042 women delivered in 6 Birmingham, England, maternity hospitals. Dr. C. R. Lowe, in the *British Medical Journal*, October 10, 1959, said there were 1,155 non-smokers and 668 regular smokers in the group. The histories of 219 women were omitted because their smoking pattern during pregnancy had not been uniform.

## **Progress in St. Louis**

Metropolitan St. Louis, Mo., during the past 4½ years, has improved its sewage disposal system by establishing standard criteria for the design and construction of sanitary and storm water facilities, reviewing private and public sewage and drainage works to insure conformity with overall master plans, and centralizing its engineering inspection department.

## **Safe and Restful**

In an effort to anticipate consumer interests, manufacturers now assert that seat belts make driving more comfortable as well as safer and improve driving skill. Seat belts today, they also say:

- Reduce fatigue and strain.
- Do not wrinkle clothing, if properly worn.
- Are available for children, and are washable.
- Improve driving skill by assisting the driver to retain control in

sudden stops, minor collisions, quick turns, or unexpected road hazards.

The lifesaving quality of seat belts, proved in crash tests, on the highways, in aviation accident studies, and by U.S. Air Force tests, remains the basic advantage, provided drivers adhere to prudent speeds.

## **Dishwashing Detector**

A powder which detects hidden grease, starch, or protein films on "apparently clean" dishes has been developed at the University of Michigan School of Public Health in an effort to help sanitarians check dishwashing performance. The powder, a mixture of dry tale and dye, is sprinkled lightly on a dry dish which is then rinsed and drained dry. Red coloring on the dish indicates a soiled area.

## **Fallout Monitors**

New York State has set up what is believed to be the first early warning system for radioactive fallout. Automatic air monitors are installed at Buffalo and Binghamton, in Westchester County, and on Long Island.

## **Radiation Pamphlet**

The Rensselaer County Health Department in Troy, N.Y., has published "Radiation Protection," a pamphlet describing the procedures and techniques which reduce radiation hazards to patients and operators during operation of dental X-ray machines.

## **Restaurant Inspections**

To eliminate unnecessary duplication of routine sanitary inspections of restaurants and similar business establishments by three State agencies, Governor Nelson A. Rockefeller has delegated primary responsibility for these inspections to the New York State Health Department. The Governor ordered the labor department to end its inspections and the agriculture department to inspect only those restaurants not previously checked by the health department. The departments of health and agriculture will advise each other when one finds violations that come under the other's jurisdiction.

# Federal Publications

**Handbook on Programs of the U.S. Department of Health, Education, and Welfare.** 1960 edition; 229 pages; \$1.50.

This handbook brings together information about the program objectives of each major unit of the Department and the extent of the problem toward which the program is directed, the scope of the program, its legal basis, and related information. In addition, the volume provides for each program a 5-year summary of fiscal, personnel, and other statistics showing program dimensions and trends.

Available for the first time as a public document, the handbook is to be issued annually. It will be particularly valuable when used in conjunction with the annual report of the Department and "Health, Education, and Welfare Trends," also published annually by the Department.

Copies may be purchased from the U.S. Government Printing Office, Washington 25, D.C. Free sample copies are not available.

**Alcoholism.** PHS Publication No. 730 (*Health Information Series No. 97*); 1960; 15 pages; 10 cents. Briefly traces history of alcoholic beverages and explores some of the reasons people drink. Explains how alcohol affects the body and behavior. Describes symptoms of alcoholism and outlines methods of treatment and rehabilitation. Summarizes and interprets current research.

**The Dental Profession in the Midwest.** PHS Publication No. 751; 1960; by Walter J. Pelton, Ruth Bothwell, and Helen M. Vavra; 20 pages; 15 cents.

Dental manpower in six midwestern States, Iowa, Kansas, Missouri, Nebraska, North Dakota, and South Dakota, is surveyed in terms of need and supply. The declining dentist-population ratio is noted, and the factors which produced it are discussed.

Two manpower projections show the deficits in dentist supply which the midwest will face in 1975. The first estimates the dental force needed to provide care for a larger population using dental services at a rate comparable to that which existed in 1958, and the second estimates the force required to meet the anticipated higher demand for dental care.

Text tables and charts provide data on the dental force and population of each State and the region as a whole.

**Introduction to Arthropods of Public Health Importance.** PHS Publication No. 772; 1960; by Harry D. Pratt, Kent S. Littig, and Clarence W. Marshall; 35 pages; 30 cents.

Arthropod-borne diseases and the ways insects and their allies affect man and domestic animals are discussed. Anatomy of arthropods and types of life cycles are described, and keys to classes and orders of arthropods of public health importance are given.

Twenty-five illustrations, a list of films, and selected references are included.

**Health Information for Travel in Europe.** PHS Publication No. 748; leaflet. Required and recommended immunizations are described. Included also are precautions on food and water consumption.

**Model State Vital Statistics Act, 1959 revision.** PHS Publication No. 794; 1960; 30 pages.

Drafted to guide States considering revision of their vital statistics laws, this model sets forth minimum principles, policies, and practices necessary to maintain an efficient and uniform vital statistics system in the United States.

The 1959 model act introduces major advances in vital statistics legislation. For example, with most births now occurring in hospitals, it places responsibility for preparing and filing birth certificates on hos-

pitals. Recommendations governing applications for delayed registrations, corrections of records, and penalties arising through fraudulent use of records have been greatly strengthened.

Copies of the 1959 act may be obtained from State departments of health, as well as the Public Health Service.

**Historical Roster of State and Territorial Health Officers, 1850-1960.** PHS Publication No. 787; 1960; 40 pages; 60 cents.

This roster is a chronological record, State by State, of the health officers under whom public health administration on a statewide basis was inaugurated and developed.

Brief historical notes tell about the origin of the early State boards of health. The introduction pays tribute to Lemuel Shattuck of Massachusetts, who delineated the pattern and precepts for public health organization in this country.

An appendix provides background information on the founding and organization of the Association of State and Territorial Health Officers.

**Sewage and Waterworks Construction, 1959.** PHS Publication No. 758; 1960; 14 pages; 20 cents.

Construction activity, as indicated by contract awards, in the areas of municipal water supply and municipal sewage disposal is summarized.

Data for various subcategories of construction are presented by major river basin, State, population size group, and contract size group. Similar tabulations have been published for the past 7 years.

**Biological Factors in Domestic Rodent Control.** PHS Publication No. 773; revised 1960; by Robert Z. Brown; 28 pages; 25 cents.

Identification of rodents, particularly Norway and roof rats and the house mouse, and their life history, behavior, and senses are discussed. Signs of rodent infestation and the ecological factors affecting rodent populations are also described.

An up-to-date list of references is provided.



**1959 Highlights of Progress in Research on Oral Diseases.** *PHS Publication No. 760; 1959; 22 pages; 15 cents.*

Directed primarily to dental public health workers, dentists, and dental educators, this booklet discusses activities at the National Institute of Dental Research, Public Health Service.

Studies on periodontal disease, caries, and other oral diseases and disorders are reported. Work in these fields by grantees of the institute is also described.

**Highlights of Research, 1959. Progress in arthritis and metabolic diseases.** *PHS Publication No. 753; 1960; 41 pages; 20 cents.*

Forty-three studies by the National Institute of Arthritis and Metabolic Diseases and by non-government research centers receiving support from the institute are described. These studies deal with rheumatic diseases, diabetes, gastroenterology, and basic research.

**Scientific Directory and Annual Bibliography, National Institutes of Health, 1960.** *PHS Publication No. 750 (Public Health Bibliography Series No. 30); 1960; 111 pages.*

Key personnel, staff members with doctorate degrees, and visiting scientists with tenure of a year or more are listed to reflect the organizational structure of the National Institutes of Health, Public Health Service, as of January 1960.

Scientific and technical papers published by the NIH staff during 1959 comprise the bibliography. Alphabetized by senior author, they are listed under the organizational unit to which he was attached when the work was done and indicate the accomplishments of each component.

**Procedures for Testing Pasteurization Equipment.** *PHS Publication No. 731; revised 1960; by Hugh E. Eagan; 43 pages; 25 cents.*

A detailed handbook on the methods of inspecting and procedures for testing milk pasteurization equipment is provided for the milk sanitarian.

This step-by-step outline, when used in conjunction with the laboratory phosphatase test and coliform

examination, should enable the control official to assure the public of a palatable supply of milk and milk products free of communicable diseases.

**Indians on Federal Reservations in the United States. A digest. Oklahoma City area and Florida.** *PHS Publication No. 615, Part 5; 1960; 34 pages.*

Data are given on Indian groups in the Oklahoma Indian health area, comprising Oklahoma and portions of Kansas, Mississippi, North Carolina, and South Carolina, and in Florida. Included is a brief description of location, ownership, and topography of reservation land, and a discussion on population groups and their social characteristics, with emphasis on homes, education, income sources, and health services and status.

**Domestic Agricultural Migrants in the United States (Map and Table).** *PHS Publication No. 540; revised 1960; 25 cents.*

To assist public health and other service agencies in identifying areas of migrant labor concentration so that they may plan adjustments in their programs to meet seasonal needs, the map indicates in round figures the number of migrants expected in each county at the peak of the crop season. The date of peak influx and the span of the crop season, as well as the number of workers and the total number of migrants, are tabulated for each county.

Data are given only for counties with 100 or more migrants.

**Nurses in Public Health. Number and educational preparation of nurses employed in the United States, Puerto Rico, and the Virgin Islands on January 1, 1960.** *PHS Publication No. 785; 1960; 52 pages.*

Based on data collected by directors of public health nursing in State health departments, this census includes nurses employed by State and local, official and nonofficial public health agencies, boards of education, and industries. The report should be useful to health agencies and professional organizations, universities, and national groups concerned with health manpower resources.

**Facts About the Professional Nurse Traineeship Program.** *PHS Publication No. 520; revised 1960; leaflet with two supplements.*

Long-term regular academic and short-term phases of the professional nurse traineeship program for administration, supervision, and teaching are described. The brochure covers basic information about the traineeships, eligibility requirements, and how to apply. Supplements list participating schools and sponsoring agencies.

**Proceedings, 1960 Annual Conference of the Surgeon General, Public Health Service, with State and Territorial Mental Health Authorities.** *PHS Publication No. 771; 1960; 48 pages.*

Reports on the manpower crisis in the mental health field and the planning of mental health facilities, summaries by 6 discussion groups on specialized programs, and 15 recommendations are presented.

The recommendations cover amendment of social security laws as they relate to type of illness covered and public assistance benefits, alcoholism activities, studies on the emotional problems of children, mental health information and education practices, mental retardation services and studies, and expansion of resources for school mental health programs.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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# ECHOES from Public Health Reports

## REPORT UPON THE MICRO-ORGANISMS IN SCRAPINGS FROM THE NAILS OF SURGICAL NURSES.

HYGIENIC LABORATORY, U. S. MARINE HOSPITAL.

New York, November 18, 1889.

SIR: In accordance with your request of June 23, I have the honor to state that I have carried on a line of experimentation to determine the micro-organisms in the nail-dirt from the nurses of the surgical wards of this hospital.

Many observers have spoken of the danger of wound infection from this source; some have asserted that it was an impossibility to thoroughly cleanse the hands, more especially the nails, of operators and assistants.

Many plans have been devised, some of which are too tedious for application, to insure the perfect cleanliness of hands. Granting that this is accomplished on the part of the operator it does not, from our observation, apply to the surgical nurses and attendants of an operating-room.

In this investigation attention was chiefly directed to the hands of the surgical nurses and those having charge of or making surgical dressings. Observations were made from time to time, extending over a period of three months, the clientele of the wards constantly changing, so that a patient designated as a source of infection would not apply to the whole series.

The nurses had been, we believe, instructed to use the nail-brush and other agents for cleansing their hands. The usual method was as follows: Scrub the hands with soap and warm water to be followed by immersion in bichloride solution (1 to 3,000), the usual ward mixture for the surgical wards.

The examinations were so timed as to take the nurses when they were making or assisting in dressings, or just before an operation. In all the examinations only in two instances were the hands found to be sterile; in all the others bacteria were found.

To make the matter as clear as possible, we prefer to give the observations in detail and allow their results to speak for themselves.

NOVEMBER 22, 1889, pp. 393-398

Assistant Surgeon Joseph James Kinyoun, whose facilities for bacteriological analysis were in the one-room laboratory he established in the Marine Hospital, Staten Island, N.Y., reported on 26 examinations of nail parings from surgical nurses. Pus organisms were found in 16, *Staphylococcus pyogenes albus* in 10, *Streptococcus pyogenes* in 4, and *Staphylococcus pyogenes aureus* in 2. He concluded that, even with careful washing, "the hands of the nurse play a greater role as an infectious agent than is supposed."